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NEWS IN BRIEF

Communications Net Locates Sick Migrant

Special to Computerworld

SACRAMENTO, Calif. — A computerized information system to keep track of migrant workers' children who attend school may have helped save the life of a 10-year-old girl with tuberculosis.

The Migrant Student Record Transfer System computer located the girl in a nationwide search after it was discovered in Utah, where she was going to school, that she had tuberculosis and needed immediate treatment.

When test results were learned, however, the girl and her family had moved and could not be found.

The system's computer in Little Rock, Ark., was contacted and within four hours the family was located — at a labor camp 20 miles west of here.

The child was given immediate treatment and her family scheduled for tests.

The system is designed to keep track of children and their school records and help teachers give them individual attention. [CW, June 14].

Data Users Should Benefit From WU Rates — Tentatively

WASHINGTON, D.C. — Some data communications users, including private line users of Series 3000 channels, will tentatively be able to utilize lower Western Union rates matching those of Microwave Communications Inc. This is the effect of an FCC order to hold hearings on the 14% to 32% rate cuts proposed by WU [CW, Aug. 2].

The decreases would be temporary if the FCC rules the cuts not competitive. MCI has said the rates are discriminatory.

The FCC hearings are scheduled to begin early next year and the lower rates will remain effective until then unless MCI initiates legal action (related story on page 23).

Univac Ups Key punch Prices

BLUE BELL, Pa. — Univac has increased rental and maintenance costs of some 1700 Series buffered keypunch equipment, by as much as 6%.

On the Inside This Week

POS Terminals Boost Data Accuracy, Cut Report Time — Page 3

FCC in the Middle Of MCI-WU Rate Battle — Page 23

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IBM Virtual Storage Systems

158, 168 Added; 135, 145 Upgraded

4 Control Systems Include New Features

By Don Leavitt
Of the CW Staff

WHITE PLAINS, N.Y. — The first of IBM's four new system control programs, Operating System/Virtual Storage 1 (OS/VS1), is now available and was used by the company last week to demonstrate the dynamic capabilities of the expanded line of 370 CPUs.

Each of the control programs is compatible with an existing version of DOS or OS, to avoid the conversion horrors that accompanied switches from one operating system to another in the past. OS/VS1, for example, is an extension of OS/MFT, IBM said.

Upgrades, Extension

OS/VS2, due in the fourth quarter of this year, is an upgrade of OS/MVT, while DOS/VS, scheduled for a year from now, is obviously an extension of DOS. The fourth control program, Virtual Machine

At a Glance

- New Software**
- Disk Operating System/Virtual Storage (DOS/VS)
 - Operating System/Virtual Storage 1 (OS/VS1), for MFT users
 - Operating System/Virtual Storage 2 (OS/VS2), for MVT users
 - Virtual Machine Facility/370 (VM/370)

- New Hardware**
- 370/158
 - 370/168
 - Upgraded 135s and 145s

Facility 370 (VM/370), will be the anticipated carryover of CP-67, IBM said.

In any case, moving into a virtual storage environment should make life easier for the programmer, IBM said, since it relieves him of concern for the real size of main storage on his CPU. With virtual storage, only the active sections of each application program need occupy main storage.

Loaded into virtual storage (normally a disk pack in the IBM system), the user's programs are segmented into fixed-length pages by the VS supervisor, which then transfers these pages to main storage as needed and as space is available.

These pages may be placed anywhere in main storage so it is used more efficiently than with conventional partitions, IBM noted.

Under VS, the programmer is free to write his code without regard to planning of overlays or similar machine-limit constraints. He can concentrate on the application logic, regardless of how much virtual storage it will occupy.

Third 'Virtual' Vendor

Dynamic allocation of main storage is a new feature for IBM, but not for the (Continued on Page 2)

Enhancements Free But Not on 155, 165

By Ronald A. Frank
Of the CW Staff

WHITE PLAINS, N.Y. — It was Christmas in August last week for users with 370/135s or 145s installed or on order when IBM announced the systems would be upgraded to include virtual storage capabilities free of charge. The field changes will take from one to three hours and will begin immediately, IBM said.

IBM also announced virtual storage packages for the 370/155 and 165, but these will be available only for purchased systems at \$200,000 for the 155 and \$400,000 for the 165.

In addition, the mainframe supplier introduced two new virtual storage systems, the models 158 and 168, which will be available in the "second and third quarters of 1973."

Both the 158 and 168 as well as the 145 will be able to operate with the IBM 3330 disk system through use of an optional integrated control feature. The Integrated Storage Control will be available on the 145 next October, IBM said. The 135 will support the 3330 via the Integrated File Adapter beginning in March 1973. Previously IBM did not support the 3330 on either the 135 or 145.

The Model 158 executes instructions 20% to 40% faster than the Model 155 and its main storage ranges from 512K to 2M characters, IBM said. The 158 console includes a CRT equipped with a light pen that allows the operator to rapidly access operational data, IBM noted.

One-Third Increase

The Model 168 executes instructions at 10% to 30% faster than the Model 165 and is available in memory sizes from 1M (Continued on Page 2)

Member-Officer Forum to Spice ACM Birthday

BOSTON — The nine founders of the Association for Computing Machinery (ACM) will be honored at the society's Silver Anniversary conference here next week, Aug. 14-16.

A Tuesday evening commemorative dinner will be one of the social highlights of the annual conference, which will feature a comprehensive technical program and an all-software commercial program.

One of the more controversial extra-curricular events is likely to be the member-officer forum on Monday evening at 5:30 in the Sheraton Boston Hotel, where all ACM '72 events will take place.

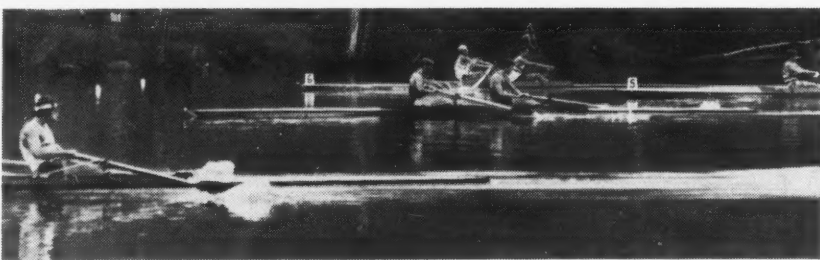
The forum was designed, ACM said, to give members a chance to meet the newly installed officers, but the ACM financial crisis will be a hot topic, many sources noted.

The emphasis will be on questions and comments from the members, ACM said; and sufficient interest in this concept could lead to similar forums during the National Computer Conferences and future ACM meetings, ACM added.

Other scheduled events include presentation of the A.M. Turing Award, ACM's highest honor, and the Grace M. Hopper Award to a young computer technician.

Two sessions are carrying ACM's billing as featured meetings, including Monday's president's panel, part of the commercial program [CW, Aug. 2].

Another panel discussion will be held Tuesday on Current Research in Computer Science. All six software-oriented members come from the industry, government and the university community.



CW Photos by B. Jones and M. Upton

Boat Race Keeps the Pace

A computerized timing system at the recent U.S. Olympic Rowing Trials, at Lake Waramuag, Conn., provided oarsmen, coaches and spectators with printouts depicting the relative positions of each boat at four points during the 2,000-meter races. Times for each boat over 500-meter segments of the course were logged on a real-time clock of a remote computer and used to compute each boat's velocity. Kent Mitchell, left, designer of the system, enters times via Teletype at the finish line. The Hewlett-Packard computer is in Paramus, N.J. Story on Page 6.



(Continued from Page 1)

Monthly rental for typical configurations of the Model 158 will range from about \$49,500, with 512K characters of main storage to about \$85,000 with 2M characters. Purchase prices will range



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Four Control Systems Include New Features

- A Hasp-like feature called Job Entry Services, that spools I/O under OS/VS1.

* The 158 and 168 require 22% of a 100M byte 3330 spindle for a maximum possible 16K bytes of virtual storage.

As part of the 158 and 168 introduction, IBM also included a free integrated emulation feature which allows the 158 to execute 370 programs concurrently with programs written for the 1400 Series

Virtual storage itself is limited by the IBM addressing scheme to a maximum of 16M bytes. This led one user to muse that



With the feature, the 168 can handle either 7070, 7080 or 7090 programs concurrently with 370 programs, IBM said. The Model 158 also includes an OS/DOS emulator that enables DOS programs to operate concurrently OS jobs.

Even if the company were contemplating a move away from the older operating systems, a spokesman noted, users would be given at least the six-months notice that is IBM policy.

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Store Limits Key punching

POS Terminals Boost Data Accuracy, Cut Report Time

By Edward J. Bride
Of the CW Staff

LANDOVER, Md. — Emphasis on commission sales, with cash registers operated by sales personnel and not checkout clerks, has brought increased data accuracy to retail outlets operated by Hahn's Shoes.

The company, a division of U.S. Shoe Retail Corp., is expanding at the rate of about 10 stores a year, and is using point-of-sale (POS) terminals to avoid a concurrent expansion of the keypunch division at corporate headquarters here.

Instead of mailing sales orders to headquarters for keypunching, stores collect all the sales data on Singer Modular Data Transaction Systems, which consist of cash registers, store-and-forward modules and modems.

Since salesmen are paid by commission, they constantly emphasize accuracy for all entries, according to Art Boyle, DP manager.

The data is collected as part of the sales transactions and rechecked at each terminal; each night the system is polled by a Singer System Ten at headquarters.

Hahn's has installed the POS units in about 28 stores, and should have them phased in to all 90 stores by year's end, Boyle indicated. The current configuration including 10K core and an automatic calling unit, will support all the stores, he added.

The System Ten collects the data on magnetic tape, which is used for input to the Hahn's IBM 360/22, which in turn prepares payroll and performs the inventory control applications.

The POS concept was tested last year at two stores in the Washington, D.C. area, and was adopted mainly because of speed, Boyle said. Each locale is polled by automatic dial-up after store hours, on a daily basis, and it only takes about five minutes (at 1,200 baud) to compile the sales and payroll information for one retail outlet, he said.

The company formerly had keypunchers preparing key-to-tape data from sales checks. While final figures are not yet available, Boyle claimed errors have been reduced by about 50% and the completion of reports is now much



CW Photo by Edward J. Bride
Manager Pete Moshos briefs two Hahn's employees on point-of-sale system.

quicker.

Key-to-tape machine operators have been reduced from 10 to five full-time

personnel, and all four part-time positions for evenings have been eliminated, reported Ed Klee, a division vice-president.

At the cash registers, the Ascii-encoded data which is recorded for polling includes the individual store number, date, the salesman's identification, the item number, discount if any, taxes and total sale.

Since the information is available on a daily basis, merchandise reports are completed in three to five days, instead of the previous ten days. While the actual ordering is performed by individuals, Boyle related, the reports indicate "hot" items, or point out the need to move one item to a store where it is moving especially fast.

The polling itself is initiated by the one computer operator on duty, who is responsible for both the 360/22 and the Singer System Ten.

The operator starts the polling process

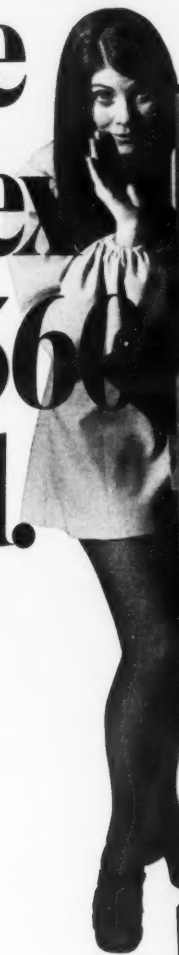
by a paper tape, and the computer informs him if attempts to reach all stores have been unsuccessful.

Klee said there were few problems in the dial system, stressing the importance of completing the merchandise report "as soon as possible." The cost and time factors were of "about equal importance" in the decision to use a POS system, he said.

Boyle said user programming, already a capability of the Singer unit, will eventually give Hahn's additional information for its reports, including size and width of shoes sold; this will enhance the merchandise report, he noted.

Salesmen in the field appeared receptive to the units, Boyle said, adding that while some of the more experienced people might have been a little hesitant at first, those who have switched to a POS unit from a more standard cash register "don't care to go back to the old way."

Your 370 CPU will never know you have an Ampex ARM-3360 installed.



IRS Mulls Printer For Blind Workers

WASHINGTON, D.C. — The Internal Revenue Service is studying a high-speed braille printer for possible use, so blind taxpayer service representatives (TSRs) can answer telephone inquiries.

While TSRs currently call a central records location and have a sighted person read data over the phone, the new printer will provide computer printouts, in braille, whenever the TSRs request them through office terminals.

IRS is phasing in a countrywide change-over from paper files to computer tape. Sighted TSRs will service taxpayers by reading data on video displays, or by requesting hard copy.

The Brailleboss printer was developed at MIT and is being tested in Little Rock, Ark., one of 48 regional offices which employ blind TSRs.

Firm's 360 Uses Ampex Core

CHULA VISTA, Calif. — Rohr Industries, Inc. is now operating an IBM 360/65 without IBM mainframe memory by using Model ARM-2365 core memory systems from Ampex Corp.

Rohr linked the Ampex memories to the 360/65 for more economical operation, said Eugene E. Prince, vice-president-general manager of Ampex Computer Products Division.

The ARM-2365s maintain the computer's capacity to store 512K bytes of data and cost 50% below equivalent IBM storage which they replaced, Prince said.

Production models of the ARM-3360—a replacement mainframe memory for 370 models 155 and 165 computers—are coming off the assembly line as scheduled. You can order as much memory as you need. Multiple units already are in operation at up to 40% savings to their users.

The ARM-3360 is plug-interchangeable with its IBM counterpart. No modifications of any kind to either hardware or software are necessary. In addition, the ARM-3360 is loaded with typical Ampex features like: A maintenance control panel that includes self-test capability. Less floor space requirements than the IBM-3360. An 8192-byte monolithic bump storage memory. And a complete spare memory module at each site. Speed,

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Central Facility to Fight Pollution

Environment Data Bank Bill Close to Congress OK

By Edward J. Bride
Of the CW Staff

WASHINGTON, D.C. — A National Environmental Data System to fight pollution appears headed for passage in the Congress, local sources have reported.

Both the Senate and the House have passed separate versions of HR56, an amendment to the National Environmental Policy Act of 1969.

Under the legislation, a network of "new and existing information processing or computer facilities" would be established.

Software and support services would be included in the proposed National Environmental Data System, which would be comprised of government, educational and commercial facilities.

The only factor to be resolved, some sources have noted, is whether the private sector will be fully utilized in building a data base.

Paul Zurkowski, executive director of the Information Industry Association, urged members of the House Merchant Marine and Fisheries Committee to draw on the business community. He said commercial companies should spend their funds to develop the systems, and then market technological spinoffs.

The White House has indicated that programs not already budgeted might be vetoed, Zurkowski said, noting use of private sector funds would be a prime way of diminishing the budget needed for the environmental system.

It has been estimated that with personnel, hardware and software costs, the proposal might cost \$50 million the first year, Zurkowski said. The government should not be spending all the money, when commercial outfits could avoid tax expenditures, he said.

The data system would "serve as the central national coordinating facility"

for the "selection, storage, analysis, retrieval and dissemination" of environmental data, according to the current wording of HR56.

This information would be "made available by all federal agencies and shall be collected and received, where available, from all federal agencies, private institutions, universities and colleges, state and local governments, individuals and any other source of reliable information," the bill states.

The director of the data system would be charged with developing, establishing and maintaining general standards to "permit and facilitate the compatibility and integration of existing and new information systems."

The director would report to the Council on Environmental Quality, established in 1969. He would assist the council in preparing its annual report, and in developing "long-range programs for the en-

hancement of the environment."

The bill also authorizes state or regional environmental centers to promote a "more adequate program of environmental protection" and improvement within these areas.

The bill was first introduced early last year, and its apparent success is despite testimony from some federal officials that such a data system would be "premature."

Milk Flowing Smoothly Here

PETALUMA, Calif. — To help manage the collection of 1.3 million lb of milk each day, the Petaluma Cooperative Creamery has installed an IBM S/7 to sense signals from a truck weighing scale and tell creamery officials daily how much milk was received and where it went.

"Previously, we could only track the milk flow on a monthly basis and there frequently were wide variations due to misplaced weight tickets and the accumulation of bad information all month long," said General Manager Gene Benedetti.

"Now that the computer collects and reports information on the amount of incoming and outgoing milk daily, we have achieved new levels of control over our entire operation," he said.

The first step in the operation begins when the tank trucks carrying up to 6,400 gallons of milk stop on a weighing



The prepunched card being inserted into a data entry unit contains information about the milk supplier or wholesale customer, which is reported to the computer along with the scale reading.

scale. The scale operator places a weight tag into a printer and sets a dial to indicate that it is a loaded vehicle being weighed.

Net Weight Reported

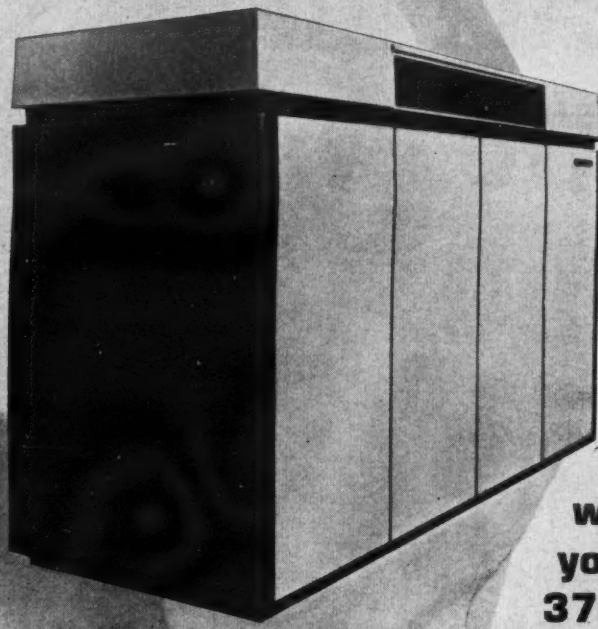
Then he also inserts a prepunched card containing information about the milk supplier or wholesale customer into an IBM 2796 data entry unit. He sets other dials to indicate the weight tag number.

All this information, including the scale reading and the time of day, is then flashed automatically to the computer. When the truck is unloaded, the operation is repeated and the net weight of the load is reported to the computer.

The data placed in the computer's storage files is also duplicated on a punched paper tape.

The computer will soon be linked to pulse counters and switches on bottling machines and conveyors to keep track of the flow of milk and other dairy products inside the creamery. This will permit a daily control of product inventory, including assurance that an adequate supply of bottles, cartons and other materials are on hand to meet the day's production needs.

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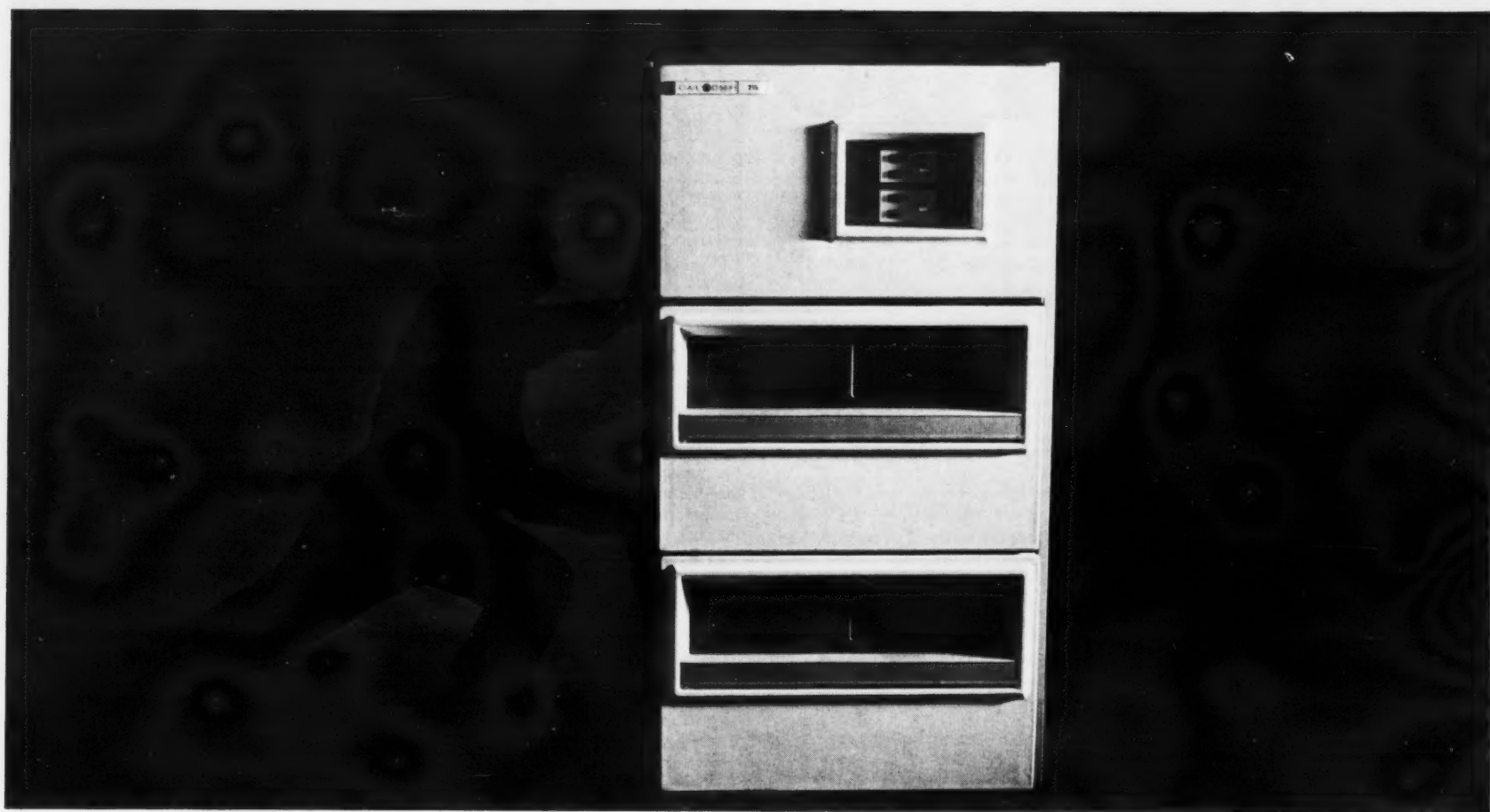
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2	UNI		UNI	5:41.96	1:58.86
3	POT	****	POT	5:27.28	1:53.23
4	TRI	****	TRI	5:29.85	1:54.28
5	MER	****	MER	5:27.19	1:55.22
6	PNC	****	PNC	5:28.37	1:54.03

2000

1	PNB	****	PNB	7:10.19	1:43.05
2	UNI		UNI	7:30.09	1:48.13
3	POT	****	POT	7:11.29	1:44.01
4	TRI	****	TRI	7:17.81	1:47.96
5	MER	****	MER	7:12.50	1:45.31
6	PNC	****	PNC	7:10.61	1:42.24

1 BOAT'S LENGTH = **** = ----

Printout shows relative positions of boats in boat lengths at the 1,500-meter and finish line of a semifinal race for the pair without coxswain event.

By Molly Upton
Of the CW Staff

LAKE WARAMAUG, Conn. — Oarsmen, coaches and spectators at the recent U.S. Olympic rowing trials here were able to tell by a glance at a printout at what point during a race a particular boat had begun to gain or fall behind.

Used at the Olympic trials for the first time, the system's printouts depicted the relative positions of boats at the 500-, 1,000-, 1,500- and 2,000-meter marks. Copies were available within about five minutes of the finish of the 2,000-meter race.

The system was designed by a former coxswain, Kent Mitchell of Jamco, Inc. in Palo Alto, Calif.

Readings taken on the progress of each boat, identified by lane, were transmitted by cable from each 500-meter mark along the course, where three men at each interval activated two switches when particular boats reached the 500-meter marks.

After the pulses passed through an inter-

face to the clocks, lights flashed on the interface box at the finish, indicating which boats had passed that point. The announcer relayed this information to the

Spotlight on Sports

spectators.

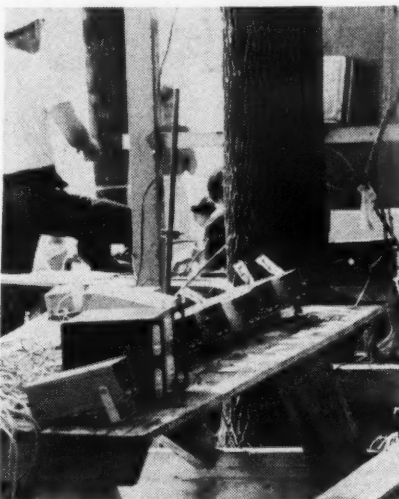
Times from the real-time clock in a remote Hewlett-Packard 2100C were displayed on six digital clocks at the finish. These were recorded manually for each interval and later input through a Teletype at the finish line to the computer in Paramus, N.J.

The interval times were stored and could have been fed through a multiplexer and printed out on the Teletype, but at the moment it was "easier and cheaper" to punch than to build a multiplexer, Mitchell said.

The printout from the Teletype depicts to the nearest quarter-boat-length the number of lengths each boat trails the leader, at each of the four intervals. Among the parameters in the program are the different boat lengths in each of the seven Olympic events, Mitchell said.

For instance, the length of a single scull, holding one man, is considerably different from that of an eight-man shell.

The system is different for each event in terms of the length of the boats involved and within each event as far as computing the average velocity of each individual boat, Mitchell said.



CW Photo by M Upton

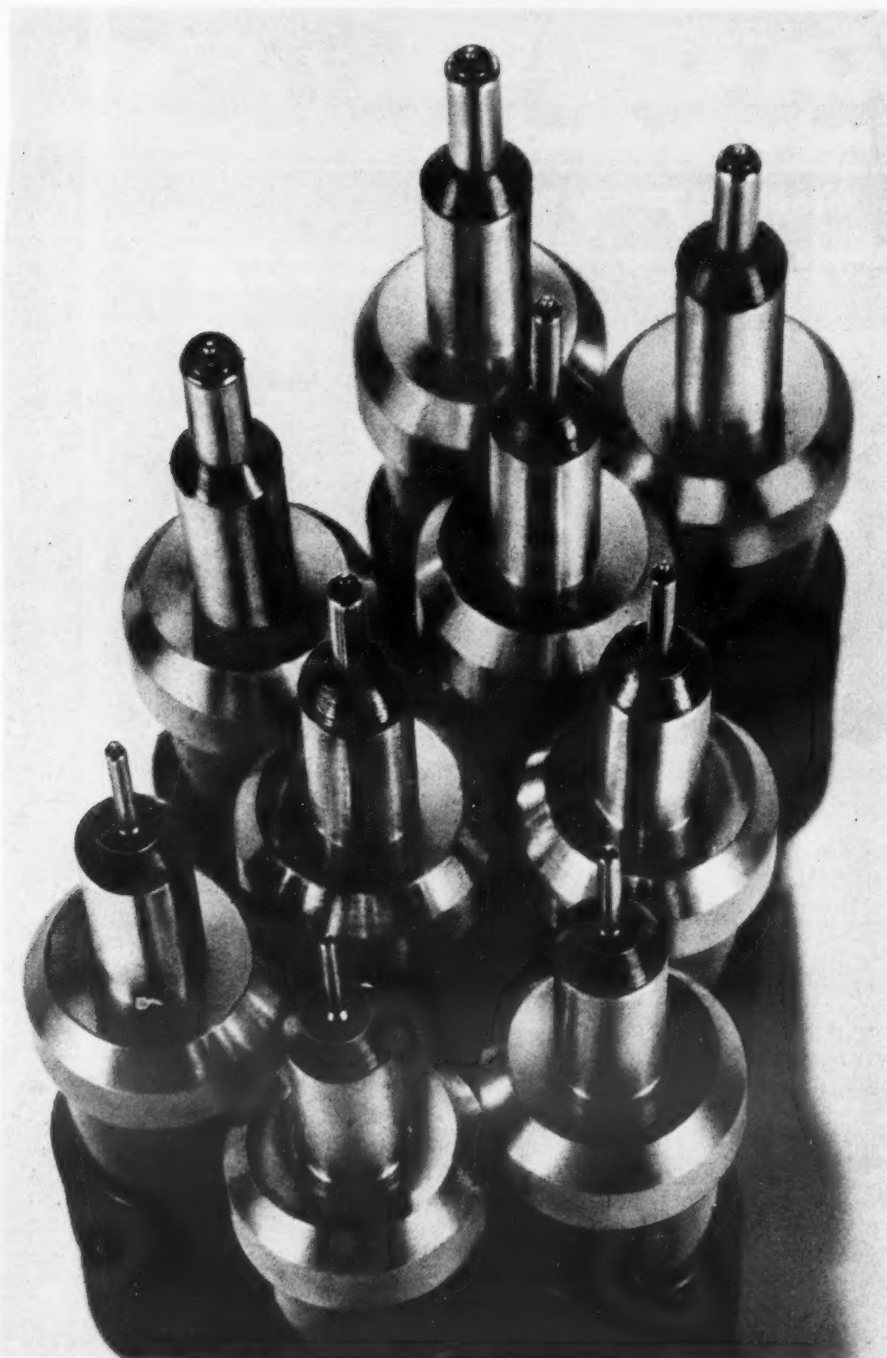
Lakeside timing is provided by digital clocks displaying interval times or "splits" for each boat.

One problem still remaining, Mitchell said, is that when the time for a boat at a given interval is not reported, the average velocity is computed on the 1,000-meter time instead of 500 meters, which mispositions that boat in the printout.

"The system is perfect, if you get all four intervals," he said.

Mitchell is now thinking about replacing the six buttons at each station with a Touch-Tone telephone, which will make the cable lighter, and provide voice communication along the course.

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Editorial

Users the Winners

New proof that vendor competition is good for the user came last week when IBM announced it would upgrade — free — all 370/135s and 145s to handle the new virtual memory and virtual machine control systems.

Although the 135s and 145s have been selling well, they apparently haven't been selling well enough to satisfy IBM. So IBM has enhanced the systems.

Not only will the enhancements give current users of these systems more for their money, but they will also give 360 users a wider choice of ways to upgrade. Since virtual memory and virtual machines carry a heavy overhead load with them, many users may decide to enhance their 360s or get 370s and not use the new software. But other users may find the new control systems are just what they need.

Any way you look at it, the users are the winners.



'...And If Anything Goes Wrong, the Rotor Takes Over'

Letters to the Editor

Researchers Concerned About Universal ID Number

We are presently engaged in research on the use of Social Security numbers as points of linkage between separate data sets containing information on the same persons.

Specifically, we are interested in the pressures mounting, both in the private and governmental sectors, toward the institution of a Universal Unique Identification Number (UUID).

We are investigating the implications of such pressures, as well as the possible consequences of UUID establishment, at both the practical and social impact levels.

We would appreciate it if *Computerworld* would ask its readers to provide us with any references, information, anecdotes or worse which might bear on our topic.

At this juncture, we are particularly interested in who requests/uses Social Security numbers and how; and instances where the Social Security number has been used as a common identifier to link information from separate data sets.

Byron S. Eckerson
Bradford M. Smith

University of California
Santa Barbara, Calif.

Consider What Is Feasible In Software Problems

Reference "High-Level Language Coding Could Speed Data Software" [CW, June 7].

It seems that in most "special" software problems such as multitasking, remote processing, time-sharing and real-time control, there has been too much focus upon difficulties, and no attention paid to what is easily feasible.

Indeed, except for a few special commands changing the status of some peripheral devices, which should be handled

at about the assembler macroinstruction level, any logic can be written in a very restricted subset of some high-level language, without any significant loss of efficiency.

One experience at Centre d'Analyse et de Programmation (France) using subset of PL/1 — fully compatible with existing PL/1 compilers and capable of a very efficient compiler of its own (CPL1) — has shown a great improvement in coding speed and cost of such practice.

By its special logic, the CPL1 compiler allows bypassing of compilation at the instruction level, which allows for direct imbedding in the source PL/1 flow of any special commands to be handled at a lower level, which are surprisingly few.

Its architecture allows for quick delivery (about 12 weeks) of the CPL1 compiler upon current commercial machines and it exists already upon the following systems: IBM 360, IBM 370, CII Iris 50, HB 6000, CII 10070, CII Iris 80 and Rank Sigma 7.

Edouard Bazeille
Software Manager

Centre d'Analyse et de Programmation
Paris, France

Manager Can Encourage Accurate Forecasting

In regard to the article, "Programming Overruns Blamed on Lack of Control" [CW, July 5], there is one point which should not be passed over lightly. Rudolph Hirsch mentions that "a good 90% of projects do not meet their time schedule," though managers can estimate "within about 10% the number of statements" required.

There is no inconsistency in the above statement. Estimations of program length are generally easy, though useless measures. Time estimates are the reverse.

In a realistic data processing environment, program specifications frequently change before a project is complete. Such changes often incur changes to existing statements, but the time required is cumulative. The same is true for machine faults, data errors and computer downtime. The time is always cumulative.

This is, perhaps, a defensive programmer's attitude. It is also realistic. When filling out a task schedule, a programmer should attempt to take into consideration the state of the computer, the probability of encountering the need for new and/or unfamiliar techniques, the current state of the software, the likely computer priorities, the chance of changing specifications, possible interrupt for previous

projects and various other attributes of the project and the environment.

Above all is the fact that the time estimation for problem solving is an art, not an exact science.

Important and correctable factors are the tendencies to underestimate a schedule to present "what the boss wants to hear," and overestimate to avoid running out of time. Generally, these are detrimental to forecasting and to time management, benefiting neither the programmer nor the company.

A manager's constant and informal awareness of project status is an important factor in encouraging accurate forecasting. The psychological factor of not suddenly running out of time and a genuine open-door policy with an informed and competent manager are as beneficial as formal written controls.

Roger Allen French
Winchester, Mass.

The Computer as Chessman

The Fisher-Spassky chess match prompts me to reformulate a question which has been bounding around the programming profession for many years in what I believe can now be seen in a more meaningful way.

Can a chess player using a computer consistently beat a player of equal skill with no computer?

Peter J. Huyek

Iowa City, Iowa

Auditor Doesn't Know DP

Regarding the comments concerning the requirements of a CDP and/or CPA certificate in the July 26 issue, I'd like to make the following comment:

It has become clear to me over the last two years in marketing software to the data processing industry that most organizations do not involve the internal auditor in "ensuring the effectiveness of information flow through the company."

I submit that the reason lies in the internal auditor's inability, in most cases, to understand the DP function and/or relate to the industry buzz words.

A basic understanding of the above by the internal auditor would elevate the position within the organization and give the organization more security, protection and control. This would help the organization maximize its investment in its protection of its data.

So, chalk up one outsider's vote for both the CDP and CPA certificates being required to audit data processing from inside the organization. The importance of this is already evident and will only

become more critical with time.

Dale A. Schneider
Regional Marketing Manager
Pansophic Systems, Inc.
Los Alamitos, Calif.

Closing the Perennial Gap

The July 26 issue of *Computerworld* contained a cartoon on the editorial page describing the perennial gap between education and the entrance requirements for DP careers.

Computer Science Technology at Texas State Technical Institute, a state-funded institution, has developed a computer programming curriculum to diminish this gap. A total of 90 credit hours earned: of this, 60 hours are spent in developing programming skills.

These skills cover several current programming languages, programming applications and systems analysis. The remaining hours are devoted to developing mathematics, communications and industrial orientation skills.

Training objectives are established semi-annually by representatives from computer installations. Experienced computer programmers and systems analysts continually develop a course of study from those objectives.

An example of this approach is the applications project. In this one-year series of courses, a student analyzes programs and documents a "live project" submitted by an organization. This project is later presented to the organization for its use. Career education, in order to be meaningful, should be very close to the world of work.

Ron Carswell
Program Chairman
Computer Science Technology
Texas State Technical Institute
Waco, Texas

Have Bicycle, Will Travel

The article in the July 26 issue on supplement/page 2 seems to imply the computer representative operating in a 500-square mile area covers something similar to the Louisiana Purchase.

This is actually a circle with a radius of 12.6 miles.

I would love to have a territory like this to cover; I could do it on my bicycle.

Raymond DeMers
Pittsford, N.Y.

It could also, for example, be an area two miles wide and 250 miles long, or any number of other shapes. Ed.



Let's Hear Some Good Computer Horror Stories

The story in *Computerworld* said the city had lost \$290,000 because of a keypunch error [CW, June 7]. In a letter to the editor Judith Jack said the cause was not a keypunch error but occurred when a letter was accepted in a numeric field. It does not really matter, however, which case you take — it was a computer horror story.

Many computer people feel this type of news should be hushed up. It should always be carefully explained that the fault was human — the keypunch girl made the mistake, or the supervisor who mistakenly returned the original wrongly punched card into the deck along with the revised card. "The computer made no mistake" is the impression these DP people would like to see in the news media.

Perhaps they are right. Perhaps it would be nice to see the press giving out really detailed explanations, but first I think we should see what action to take.

The Taylor Report

By
Alan Taylor, CDP



Taylor Thoughts: An Idea for Operations

Ron White of Beverly, Mass., has come up with a simple idea to control the accuracy of the documentation used by computer operators.

It's a simple one — simply that no original documentation is supplied to them. This means that no pencil scribbles, pen marks changing the wording and typed notes are allowed in the computer room. All the operating instructions must come from the control section — and must be copied before being supplied to the operators.

White can now walk through his computer room, and check any unauthorized or undocumented changes the operators may have made — simply by seeing whether the material has been altered — which is quite easy.

Let us see whether the computer system made any errors before we object to its being blamed.

In the keypunch error-story a card was read and accepted into the system even though it had not been verified. Was it really just a human error — or was it computer system failure?

The reason is very simple. Our card readers now only read data — and not the environmental detail, such as the verification mark. They could do that — and should do that! There are two types of cards — verified and unverified cards, and our readers should be able to distinguish between them.

Why should this not be so? It is very simple to arrange that the reader also reads a verification mark and passes it along with the data. It is very simple to have a program that not only checks whether the data has been received, but also whether or not it was received on a card with a verification mark.

We do not have such hardware. And this is bad. The first lesson we must learn from this particular horror story is that the hardware we use does have basic system flaws in it.

Computer Arithmetic Wrong

We also know that a field was accepted with an alphabetic where it was supposed to be numeric. Later the hardware somewhere accepted an alphabetic into numeric calculations. This is something that even a clerk would not do. I doubt whether it would even be done by a first grader. And yet our great geniuses — fast mathematical machines — happily do it. Moreover, they do not think there is anything wrong with it! The horror story teaches us that the computer hardware can make mathematical errors — C is not equal to 7; and the treatment of a symbol for C, as a symbol for 7, is a mathematical flaw. Computers do make mistakes.

Basically then, those "blame the computer" horror headlines are often correct. Computers can add wrongly.

Again, then, we must realize we can have computers which do, and others which do not, permit alphabets in their arithmetic. We can again separate computers that reject alpha-

betics from computers that accept them.

But then we come to the other possibilities, the possibilities urged by Judith Jack. She is quite right. The program in use, although designed for a com-

"Let us see whether the computer system made any errors before we object to its being blamed."

puter which permitted arithmetic flaws, and for use with a data input system which did not guarantee that only verified cards were used, simply assumed numerics would always be in the arbitrarily selected numeric fields. But the edit routine could very easily have checked for this.

A good compiler should include — particularly when its systems accept alpha data in numeric fields — such a check. In any case this can be programmed. A DP professional programming the system would check whether this occurs. But apparently he didn't in this case.

As described in the press, then, the editing routine was also faulty. That is another lesson.

Note that I used the word "also." The fact that one part of the system breaks down is no excuse for the other part of the system to miss the error.

In the case concerned there appeared to have been at least five errors — a keypunching error, a supervisor error returning the wrongly punched card when it had been detected back into the pack, a hardware error using a punched card input that does not discriminate between verified and non-verified cards, a mathematical computer error producing the wrong result when given invalid data, and, finally, an input editing error.

Catching five errors is a lot of bother, some people may say. DP people do have a duty to their employers, however, and where the employer — often on the advice of his computer expert — uses a system with as many flaws in it as this one has — under a contract that puts all liability for such types of error onto the user and not onto the supplier of the inadequate hardware — then I can see no reason why it should not be standard professional conduct to check carefully. Checking can be productive — even after the event.

For instance, checking here has helped us find five error situations, of which three are fundamentally DP. If we now take these three DP areas — unprotected input systems, incorrect arithmetic and inadequate edit

capability of the hardware to provide safety information as well as data and the capability of the computer to produce mathematical errors, as well as mathematical output.

Horror stories, then, may be extremely useful.

They are a pretty good way of finding out what is wrong with ourselves. Let us investigate them — not hush them up!

And so, if you have any horror stories, or if you get any in the future, please send them to Alan Taylor, c/o The Taylor Report, Computerworld, 797 Washington St., Newton, Mass. 02160.

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On August 14-16, ACM will be holding its National Conference in Boston. As part of the commercial program of this Conference, the Cullinane Corporation will make a technical presentation on its family of output processors for use with data base management systems. Specifically covered will be IMS/CULPRIT, TOTAL/CULPRIT, and user department versions including EDP AUDITOR, PERSONNEL-EDP-REPORTER, MARKET EDP ANALYZER, and PORTFOLIO-EDP-REPORTER.

While the presentation will be primarily technical, consideration will be given to the benefits of the system to data processing management and why the concept of a family of output processors including user department versions has been so successful.

For those attending the Conference, the presentation will be made at 1:30 p.m., Hampton Room, Sheraton Boston Hotel, on Tuesday, August 15th. Brochures on the above products may be obtained by writing:



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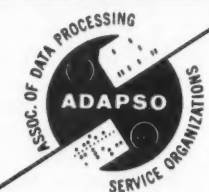
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The Professional's Viewpoint

Any Type Software Can Be Run On New Type of Computers

By W.T. Wilner

Special to Computerworld

I read on the July 12 Professional Viewpoint page that the Society of Professional Data Processors would like to know how useful multilingual machines (like the Burroughs B1700) really are.

This Professional Viewpoint Page was produced by the Society of Professional Data Processors, in conjunction with the editors of *Computerworld*. Societies interested in the preparation of this page should contact the editor of *Computerworld*.

The technical name for these machines is Universal Host Computers or UHCs. Such a machine can do more than simply read several computer languages — like Cobol, Fortran or BAL — after they have been translated into the machine code

that the particular machine demands.

UHCs can change their own machine code as occasion demands so as to assist in reading the actual source language concerned — actual Cobol statements or actual Pegasus machine code, etc.

For each particular language a special machine code or microprogram must be designed and implemented — but the UHC itself stores many such codes and can switch between them, thus originating the multilingual characteristic.

In the short term, UHCs promise to make every software program ever written available to the users of suitably loaded UHCs. This would be done by providing direct emulation facilities, and would require emulators for the machines on which the programs were originated.

Such widespread use of direct emulation has been impractical until now because of

Professional Opinion Questionnaire On Whether Profession Should Support UHC Visions

1. In the short range Wilner sees UHCs making software much more widely usable through direct emulation. How would you rate the importance of such a result to our profession?

- ☐ Unimportant ☐ Interesting, but not deserving active support ☐ Deserving active support

☐ Other _____

2. In the intermediate range, he sees UHCs providing for really machine-independent programming languages. What is your rating of this goal?

- ☐ Unimportant ☐ Interesting, but not deserving active support ☐ Deserving active support

☐ Other _____

3. Finally, he sees UHCs as a practical way to unify the industry. What is your rating here?

- ☐ Unimportant ☐ Important, but not deserving active support ☐ Deserving active support

☐ Other _____

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the complexities of manipulating the words of the original machine in terms of the often different word lengths of the

emulating machines.

With UHCs this difficulty disappears, and direct emulation becomes practical for the first time. The UHC has no inherent word length of its own, but instead can adopt the word size (and other characteristics) of the machine being emulated.

Great Potential

Potentially, therefore, UHCs can make all the software developed (at the cost of many billions of dollars and with much duplication of effort) available to the user of any UHC machine. This is in contrast to the current situation where only a tiny fraction of the existing software is available to any given installation.

True, the installation will have some costs to bear and emulators for the original machines will have to be purchased. But these costs can be small dues if they enable millions of dollars worth of software to be placed at an installation's disposal.

In the intermediate term, UHCs provide an opportunity for programming languages to be made strictly machine independent.

Language definers would need to specify the semantics of every language construct in terms of a hypothetical machine's operations. Each multilingual machine would interpret the hypothetical machine, providing identical program behavior from system to system.

Because of its multilingual capability, such interpretation is usually faster than present-day execution. Our experience is that such hypothetical machines are typically 10 times more powerful at executing algorithms in their particular languages than are contemporary general-purpose machines.

The UHC need only interpret at one-tenth the state-of-the-art speed of execution to be as fast. With machine-independent languages, programs are transportable from system to system. It's like having one alphabet, instead of Russian, Chinese, Greek or Roman.

Different languages are still possible, but one's typewriter is equally useful for all of them. Language definers can also specify the exact implementation of compilers, if necessary, on these hypothetical machines. There are good reasons for not doing so, but it may be done.

In the long term, multilingual machines free computer scientists from past hardware and encourage them to think more about information processing and the vast universe of alternative mechanisms which can solve man's computational problems.

Right now, UHCs appear to be the only practical way to unify the industry. It will no doubt take considerable initiative from societies in order to bring this about.

Wilner is manager of the systems technology department in the Burroughs Corp. Santa Barbara, Calif., plant and has been closely connected with the development of the multilingual B1700 series.

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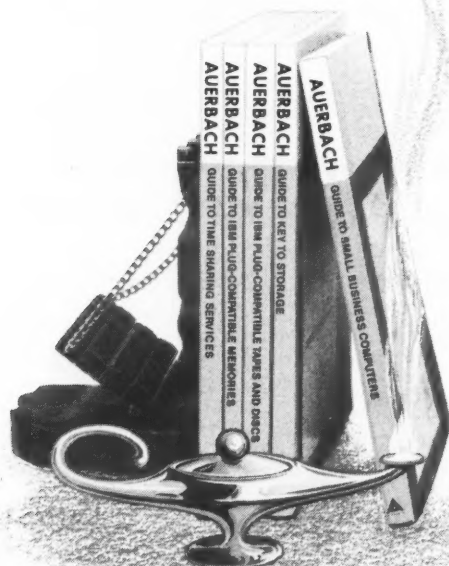
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Random Notes

Feature Links ADR 'Roscoe' To User-Developed Programs

PRINCETON, N.J. — The Roscoe conversational remote job entry software from Applied Data Research (ADR) has been enhanced to enable the user to control the loading and subsequent execution of programs from an OS library in an on-line mode.

Eight such programs can be supported concurrently, ADR said, adding that they may be in any source language as long as they conform to "certain Monitor conventions."

Examples cited by ADR suggest that the feature could be used to provide on-line editing of data being entered at the Roscoe terminal. ADR is at Route 206 Center, 80540.

Banks Build Reference Files With CIF Package From IBM

WHITE PLAINS, N.Y. — Banks operating under DOS/360 can build cross-reference files to display data about related accounts on IBM 2260 CRT terminals, with a field-developed Customer Information File (CIF) program from IBM.

Inquiries from the 2260 may be based on a known accounts number or a name. Once the response is displayed, the operator refers to separate application files for detailed information, IBM said. The system uses approximately 66K bytes of core and leases for \$1,320/mo for 12 months.

Seventh Version of 'Databus' Extends Datapoint 2200 Uses

SAN ANTONIO — A seventh version of Databus, a Cobol-like language is available to users of Datapoint 2200 intelligent terminals, according to the vendor, Computer Terminal Corp. The language is designed to ease creation and debugging.

Earlier versions of Databus supported other specific system functions ranging from commands for data communication Manuals on Databus are available from 9725 Datapoint Drive, 78284.

High Speed Available for APL

GREAT NECK, N.Y. — Support of 120 char./sec transmission rates, now available to users on the Time Sharing Resources (TSR) network, should make APL an "ideal tool" for CRT terminal-based information retrieval systems, according to TSR. Lower speeds may be appropriate for teletypewriter input, but not for the more sophisticated units, the vendor said.

The high-speed service complements other APL enhancements, including 48K byte workspaces and file support, available from TSR at 777 Northern Blvd., 11022.

B-1700 Logic Meets Users' Purposes

By Don Leavitt
Of the CW Staff

DETROIT — Unconventional software on both the machine code and microcode level, and not hardware, is how Burroughs expects to make its B-1700 Series CPU into an "ideal machine" for whatever high-level source language the programmer uses.

Most users have different objectives when they use different languages. But most computers, using hardware to convert the program logic into actual executable processing steps, require a single, common object-level code system regardless of the original language.

Compromises must therefore be made in the machine design and the system may

end up very good for one language and not for others, or not especially good for any.

The B-3500 was cited by Burroughs as an example of a machine that was "ideal" for the Cobol of its day.

Analysis

The B-1700, on the other hand, has no single set of machine-level instructions, and the source-level language processors are not assemblers or compilers in the usual sense.

They are basically interpreters and each generates an intermediate "S-level" code

stream, including instructions particularly appropriate for the source language. During execution, this "S-level" code draws into core a microcoded translator that emulates the machine the designers see as ideal for the programmer's original language.

Microcode Replaced

The microcode system in core is replaced dynamically just as "S-level" code for a different source language is loaded for execution. In effect, then, the B-1700 responds to the user's original desires.

A review of a preliminary manual indicates that the B-1700 microcode is at least close to conventions followed in other microcode schemes.

Reports Based on 'Grasp' Data Generated by Non-SDI Package

McLEAN, Va. — Johnson Systems Inc. has modified its DOS Performance Measurement and Accounting System to work with the job accounting data tape generated by Grasp, as well as with standard DOS accounting data captured by the Johnson system itself.

The two sources of accounting data can be used separately by the report writer module of the Johnson package, or combined simultaneously to produce comprehensive studies of system utilization, the firm said.

Grasp, originally a spooling package from Software Design Inc. (SDI), Burlingame, Calif., now supports many other system functions, including the generation of job accounting data that many users consider broader and more extensive than the data available directly from DOS.

SDI admits, however, that the report formats used by Grasp are rigid and limited.

Johnson's report writer capabilities, on the other hand, are open-ended and controlled by user-supplied parameter cards.

A new parameter on the control cards "tells" the module which records — Grasp or standard DOS, or both — will be in the input tape.

The Johnson package is available for a one-time license fee of \$1,450, including a one-year maintenance guarantee. A monthly lease plan is also available.

(Grasp is not marketed by Johnson and inquiries should be addressed to SDI at 873 Hinckley Street, Burlingame, Calif. 94010.)

Johnson Systems Inc. is in the Grant Building, Westgate Research Park, 22101.

'FDR' Eases OS Disk Support

FLANDERS, N.J. — IBM 2314- and 2319-type disk packs may be dumped to tape in 15% to 30% of the time taken by the standard OS/360 utility by using the low-cost Fast Dump Restore (FDR) program recently released by Innovation Data Processing.

The \$990 FDR runs under all versions of OS on IBM 360/370 equipment. It is compatible with IBM disk packs and their plug-compatible replacements, and supports all tape drives which operate on a 360 or 370, Innovation said.

Tests of FDR on several configurations are said to show that a typical disk pack is dumped in two-and-a-half to four-and-a-half minutes. Full packs take between three-and-a-half and seven minutes, the company said.

By contrast, the standard OS utility takes "about 20 minutes" to dump a disk pack, Innovation claimed. Restore times

are always less than dump times, with either the IBM utility or FDR.

Use of the faster, more tape-conservative FDR should allow the user to protect his data more frequently than is practical with the IBM-supplied utility, the firm said. This in turn would mean faster regeneration of current files in the event of a catastrophe, Innovation said.

The company also claimed FDR is fast enough to justify storing data files on tape and shifting them to scratch disk packs for processing, thus reducing the number of dedicated packs in the user library.

The Innovation utility includes object deck, documentation and a source listing. A copy of the source code on tape adds \$50 to the cost, the company said.

Innovation is at 14 Cloverdale Drive, P.O. Drawer F, 07836.

Decsystem-10 Users Offered Free Focal

ATLANTA — Source code for Focal-10, an implementation of the Focal language for the Decsystem-10, is being given away to interested users — for the cost of reproduction — by one of the developers, Digital Communications Associates (DCA).

The only restriction is that user improvements and augmentations are also expected to be distributed free, DCA said.

Focal was originally developed for the DEC PDP-8 minicomputers, and Focal-10 is the first implementation of the language on a full-scale CPU.

Focal-10, developed by DCA and Emory University, is intended to be compatible with the augmented Focal-F, now available for the PDP-8.

Utilizing many of the concepts required by the smaller CPUs, Focal-10 is said to be extremely core-efficient, requiring 2K words of sharable core, along with a 1K word non-shared segment for each user. This means, according to DCA, that Focal-10 requires only 20% of the core needed by other languages on the system.

The new implementation takes advantage of the Decsystem-10 internal speeds and executes instructions from 25 to 150 times faster than on the minis, a spokesman added.

To encourage user modifications, Focal-10 is coded in DEC's Macro-10 assembler language and the source listing is heavily commented.

The developers will send a Focal-10 listing, but not the source code itself, to non-Decsystem-10 users. Otherwise the entire package is available to all interested users including time-sharing vendors.

Focal-10 will be made available to Decus, the DEC users' society.

DCA is at 2801 Clearview Place, 30340.

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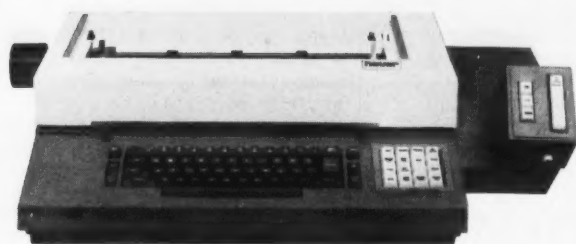
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Tymshare Adds PDP-10s to Network; National CSS Plans European Link

Subscribers and potential users of time-sharing services have two new offerings to consider, one extending National CSS geographically, the other adding to the work that can be done on Tymshare's Tymnet system.

As of Sept. 1, National CSS will open an office in London, England, through which users can access by a local phone call programs and data files stored on the network's dual 360/67s in Stamford, Conn.

Tymshare, meanwhile, is putting three Decsystem-10 processors onto its network to complement service already provided by multiple Xerox 940s.

Tymcom-10

Under a new service, Tymcom-10, a user will access whichever type of system is best for his needs, through a call to a single local phone number.

In addition, Tymshare has implemented two processing modes, deferred and detached for economical service if speed is not a user's prime concern.

Deferred processing allows the system to schedule job execution on a delayed basis, probably to non-prime time. In detached mode, the job is begun immediately and several jobs may be executed concurrently to optimize the subscriber's time on the

system.

Tymcom-10 supports terminals with speeds of 10, 15 and 30 char./sec, the company said. By adding the batch capabilities of the DEC PDP-10s the network is following the pattern of other time-sharing vendors (most recently Honeywell [CW, July 12]) of supporting production work as well as interactive problem solving.

National CSS is following GE in linking European users to a CPU, programs and data sets located in this country. In this

way, user locations on either side of the Atlantic will be able to update and inquire against a common data base.

National CSS expects to handle its transoceanic data traffic by cable to avoid the time lag of about one fourth of a second in satellite transmissions.

The company will have an Infotron multiplexer in London and will handle most speeds up to but not including 300 bit/sec, which, the company said, requires too much of the bandwidth the service will use at first.

Assembler Source Coding Charted, Analyzed by 'Quick-Draw' Version

PRINCETON, N.J. — Assembly Language programmers can now generate syntax analyses of their source code, including flowcharts, program diagnostics and related cross-reference lists with a new version of the Quick-Draw system from National Computer Analysts (NCA).

The A-12 Quick-Draw incorporates several of the Cobol version features. It accepts assembly programs from a card reader, magnetic tape or disk and normally sends output to the printer, but can direct it to tape or disk for later "off-line" printing.

The flowcharts are produced in the same order the source statements are written, so that they can be used side-by-side with the program listing. The symbols used conform to Ansi flowcharting standards, and the charts include text, flow connectors and reference information to provide a graphic representation of the program logic, NCA said.

Quick-Draw produces a cross-reference of all programmer-supplied terms, including literals, special register, names, procedure names and data names. A separate list defines all "equates" together with references to the equated terms.

A third listing contains diagnostics as well as citation of certain op-codes, notably program linkage, I/O, PERFORM-type instructions and privileged instructions, for which special attention may be required.

Optional Listings

All listings are optional and may be suppressed if not desired, by means of run-time parameters, an NCA spokesman noted.

The A-12 Quick-Draw can be used for assembly program analysis on the IBM 360/370, and Univac Series 70 and 9400 CPUs. It is available under a three-year lease for \$4,200, from NCA at Highway One, Farber Road, 08540.

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Bits & Pieces

Xebec Fixed Disk Drive Usable With Any Mini

SUNNYVALE, Calif. — Xebec Systems, Inc. has a Mega-Stor large capacity fixed-disk storage system for any minicomputer, the company said.

The \$6,000 device allows a choice of 12, 16, 24 or 32 sector sizes; sector data formats are 32 to 256 words. Average access time is 75 msec.

Included in the system are double frequency write data generation, control and data error checking, programming and absolute write protection, multiple disk unit addressing, seek overlap, preamble generation and checking, sector and work counters and data word buffering. Xebec Systems, Inc. is at 566 San Xavier Road, 94086.

Datapoint Gets Selectric Interface

SAN ANTONIO, Texas — Computer Terminal Corp. has announced a Selectric Typewriter Interface for its Datapoint 2200 Business Computer System.

With the \$150 interface, the Datapoint 2200 can drive an IBM 735 Selectric typewriter for printing applications, requiring upper and lower case capability and typewriter quality printing.

The typewriter prints at 14.8 char./sec and connects directly to the processor through the interface. The firm is at 9725 Datapoint Drive, 78284.

Recorder Handles Fanfold Input

CHICAGO — The Inter/COM microfilm recorder from Bell & Howell can handle fanfold as well as single-sheet paper for filming.

The \$2,495 recorder handles computer printout at 5,000 line/min. A hand feed shelf and stacker provides recording of legal size documents.

First deliveries of the Inter/COM will take place this month from 6800 McCormick Road, 60645.

Shorter Pieces

Dust-Off, from Falcon Safety Products, Inc., Mountainside, N.J., is a hand-held dusting instrument used to clean delicate surfaces that can't be touched or reached. It is designed for cleaning microfilm, disk and tape drive components. A blast of Freon gas is used as the cleaning agent. Prices start at \$2.75.

A furniture planning kit designed for data processing installations, including color photographs and descriptions of each item as well as a 22 in. by 34 in. floor grid and scaled die-cut blocks, is offered by Porta Systems, Corp., Roslyn, N.Y.

Correction

IBM has approved the Computer Investors Group memory installation on a 360/155 for standard maintenance, not the 370/135 as reported in the July 26 issue.

DEC Adds 3 Computers, Peripherals

By Frank Piasta
Of the CW Staff

MAYNARD, Mass. — Digital Equipment Corp. has added three new computers to its list of products and made new peripherals available for an existing line of computers.

Among the new machines are a low-cost and medium-priced version of the PDP-11, and a new, lower-priced version of the PDP-15. The peripherals are designed to extend the capabilities of the PDP-11/45.

Designed to execute standard instruction 1.8 times as fast as the PDP-11/20, the new PDP-11/40 costs about \$655 below the older model, or around \$13,000.

An optional hardware floating-point package can improve instruction execution speed by a factor of 10 and a memory management facility permits the user to address up to 124K words of main memory, the firm said.

The PDP-11/40 features an expanded instruction set to include almost all the instructions of the PDP-11/45. Micro-programmed multiply/divide are included in an optional set of four instructions, KE11E, priced at \$1,200.

The hardware floating-point option performs an addition in 20.7 μ sec, a multiply in 35.9 μ sec.

The KE11F option is \$1,300.

Memory is divided into 4K pages. The user supplies the relative address and the transformation is accomplished in 150 nsec. Memory protection is also provided for multi-user environments. The option costs \$2,300.

Standard equipment on the 11/40 includes a Unibus to allow data transfers at up to 2.5 mword/sec, and a fully vectored 4-level interrupt scheme is a power-fail/restart feature.

The PDP-11/40 with 8K words of 900 nsec core memory, Teletype ASR 33 terminal, programmer console and power supply costs \$12,995. Deliveries start in November.

PDP-11/10

The PDP-11/10 is an end-user version of the PDP-11/05 OEM mini. Designed for single-task applications, the new version offers the instruction set of the 11/20 and includes an 8K 16-bit word, 900 nsec core memory expandable in 8K increments to a total of 24K.

Four levels of priority interrupt and power fail/auto restart are provided along with a real-time clock, programmer console, four peripheral slots and either a DEC LA30 or Teletype ASR 33 interface. Price for an 8K machine with TTY interface and paper tape software is \$6,995.

Singer Expands Terminal Series

NEW YORK — The Singer Co. has added two on-line cash register/terminals to its 900 point-of-sale series for use in retail applications.

The 902 and 925 terminals can be programmed for positive and negative credit assessments, make multiple copies of sales checks or cash receipts and provide an audit tape of each transaction.

The 925 features a side-insertion printing mechanism with alphanumeric printer with two print heads that independently produce an audit tape and receipt.

The dual-head matrix printer is controlled by a read-only memory that allows a change of character set including international symbols with a simple substitution.

The printer distributes an equally optimized strike force and creates 9 by 7 matrix characters of equal density, enabling the unit to print up to six copies with excellent quality, Singer said.

Operating at 120 char./sec, the dual-matrix head simultaneously prints a 29-character line upside down on the sales receipt and a 30-character line on the audit tape.

Other features of the terminals include positive credit authorization, selective itemization, tax table look up, minimum-maximum entry digit checking and transaction counts.

The Model 902 costs \$3,200 and is available for delivery in January 1973.

Current users of Model 900 terminals can field-modify their units to 902 specifications for \$300.

The Model 925 with side insertion printing will sell for about \$3,500. Deliveries will begin during the second quarter of 1973.

Memory Minimizes Core Failure

NEWTON, Mass. — Designed to replace the 3360 memory units on an IBM 370/155, the 370/Stor add-on memory from Cambridge Memories offers an unusual means of minimizing the effect of core failure.

The 256K modules are equipped with a fail-safe feature that allows the operator to eliminate system downtime by assigning defective memory addresses to the highest address sector, letting the system operate at the next lowest memory level.

The expansion unit is equipped with necessary wiring and power supplies to allow an upgrade from the minimum 256K capacity to the maximum of 2,048K bytes in the field within 72 hours, the company said. A single cabinet is used for the full range.

The memories are fully compatible with IBM hardware and software, with access times equal to the IBM units they are designed to replace. They can operate on any model of the 370/155, eliminating

Delivery is 60 days.

The latest model of the PDP-15 18-bit word series, the PDP-15/70, takes advantage of the savings due to in-house-built memories to offer prices 20% to 30% lower than older models.

The new memories have a speed of 980 nsec and cost \$8,000 for 8K words and \$14,000 for 16K-word increments. The older 800-nsec memory costs \$11,000 for 8K and \$20,000 for 16K words.

The minimal configuration includes a CPU, 16K of memory, 30 char./sec Decwriter terminal, paper tape reader/punch, extended arithmetic element and real-time clock and sells for \$31,500.

The new peripherals for the PDP-11/45 include two line printers, two card readers and two disk systems.

The line printers are available with either 64 or 96 character sets and print a 132-column line. The 800 line/min LP-11RA costs \$30,000 and the 1,200 line/min LP-11SA is priced at \$33,000.

The CD-11A and the CD-11E card readers feature vacuum picking and air rifle operation. Card loading and unloading may be performed during reader operation and data transfer is performed by a direct memory access without CPU intervention. The 1,000 card/min CD-11A costs \$10,000 and the 1,200 card/min CD-11E costs \$14,000.

The RP-03 double-density moving-head disk pack system provides more than 300M bytes of storage. Data transfer rate is 6 μ sec/word with an average access time of 20 msec.

The RK05 moving-head cartridge disk drive has a 2.4 mbyte/drive capacity, an average access time of 50 msec and an 11 μ sec/word transfer rate. The RP03 including control unit is priced at \$36,000. The price of the RK05 is \$5,100.

the need for CPU upgrades when memory is expanded, the company said.

The cost of the upgrade necessary when a user expands the capacity of his system with IBM memories ranges from \$12,000 to \$125,000 per processor.

The prices of the Cambridge memories range from 30% to 60% below those of the 3360 units, the firm added. An expansion unit to replace the first 256K of memory as a two-year lease price of \$2,000/mo and sells for \$105,000. The equivalent 3360 Model 1 costs \$132,000 and rents for \$3,000/mo.

The maximum upgrade of 2,048K bytes from Cambridge Memories costs \$480,000 and a two-year lease costs \$14,400/mo. The equivalent IBM prices are \$1,056,000 and \$24,000/mo. Long-term leases are unavailable from IBM and the IBM prices do not include the cost of CPU upgrades.

Initial deliveries will be made in September from 285 Newtonville Ave., 02160.



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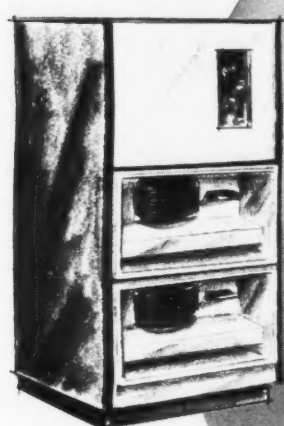
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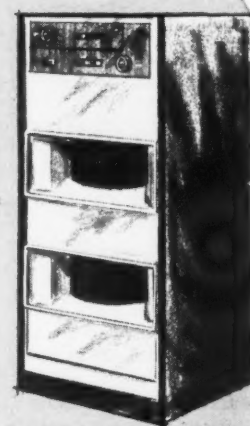
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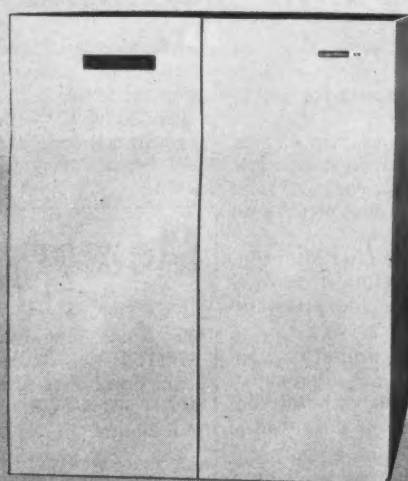
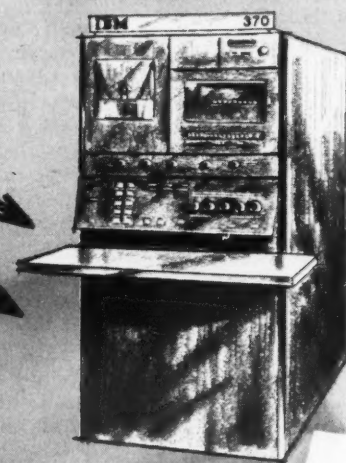
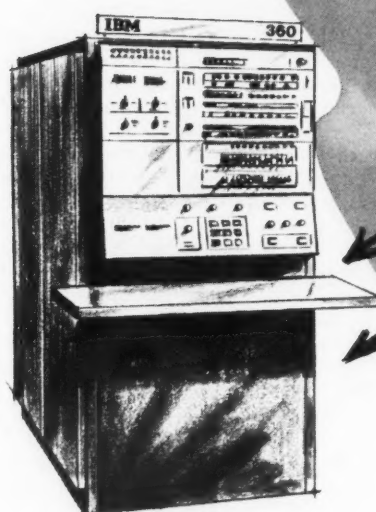
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2314 Compatible Disk File



CIGTROL Model 6730

Feature	CIGTROL Model 6730	IBM Controllers	
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3330 Compatible on 360/65, 67, 75	Yes	No	No
3330 Compatible on 360/30, 40, and 50	Yes	No	No
Price/Performance Features <ul style="list-style-type: none"> ■ Rotational Position Sensing ■ Command Chaining ■ Multiple Requesting ■ Microprogramming 			
ON IBM 360/65, 67, 75	Yes	No	No
ON IBM 370	Yes	No	Yes

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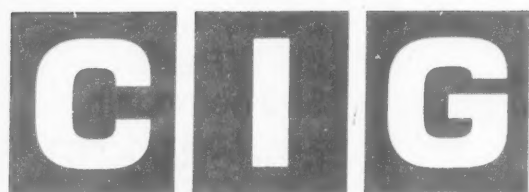
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Low-Cost TI Mini Stresses Features, Performance

HOUSTON — The 980 A mini-computer from Texas Instruments offers higher performance and more features at about half the price of the company's previous general-purpose model.

The 980A, although similar architecturally to the 960A, is functionally similar to the company's two-year-old 980 mini.

Included as standard features in the base price of \$3,475 for the 980A are 4K 16-bit words of semiconductor memory with a cycle time of 750 nsec, hardware multiply/divide with double precision, programmable memory protect, parity and dynamic relocatability.

Power fail/restart, an I/O bus with four ports (expandable to 13 ports in the basic chassis and 256 overall), direct memory access channel expandable to eight ports, an auxiliary processor port and a switch-initiated ROM bootstrap loader are also standard.

Four Interrupts

Other features include four hardware interrupts expandable to 64, bit/byte/word/byte-string data addressing, 98 basic instructions, eight working plus one status registers, lockable and removable front panel with breakpoint and four sense switches

and a power supply that can support 64K of memory.

Software Included

Factory-supported software for the 980A is upward-compatible from the 980. It includes an operating system with support operator job control, disk file management and dynamic protection of memory using the memory protect privileged instructions; Fortran IV; symbolic assemblers; cross assemblers for IBM 360/370 source; object and linking editors, and TI Language Translator (Tilt) to extend Fortran and assembly language or to create special applications lan-

guages.

An optional battery pack is priced at \$100 and provides standby power to protect a 16K memory for at least two weeks. The pack is about the size of four "D" cell batteries, the company said. Additional 4K memory modules cost \$1,500. The 980A can be expanded within the basic chassis to 32K, and to 64K with an auxiliary chassis.

In contrast, the 980, which has a cycle time of 1 μ sec, and does not include many of the standard features of the newer model, sells for \$6,850.

The 980A is intended for applications in data communications,

scientific and small business data processing and front-end pre-processing.

Delivery of the 980A is 45 days. Texas Instruments, Inc. can be reached through P.O. Box 1444, 77001.

BASF Unveils Lower-Priced Endura Mag Tape

BEDFORD, Mass. — BASF Systems, Inc. is selling its new Endura line of magnetic tape at about 20% below its top line of 100% certified tape.

The Endura tape is certified on a sample basis, the company said, with the resultant savings in production costs passed to the user in lower prices.

Quality of materials has not been compromised in the new tape, the company pointed out. The Endura uses the same basic formulations as the BASF 2000AD premium tape.

The tape is guaranteed to meet applicable government specifications on the same terms that apply to the company's premium tape, BASF said.

The company said it would replace any bad tapes found by the user.

The tape is recommended for about 75% of tape applications in the typical user installation. The company still recommends the use of premium tape, which is 100% certified for critical files and for long-term storage files.

Prices depend on quantity, ranging from about \$10 in small lots to about \$7.50 in lots of 10,000 reels. Delivery is immediate from Crosby Drive, 01730.

Device Recovers Analog Data

ROCKVILLE, Md. — A unit that demodulates a tape-recorded FM subcarrier to recover analog data for computer entry has been introduced by Tri-Com, Inc. The Model 602 allows a computer to select from three different channels and three data filters, and also signals the computer if high-in-band noise levels occur. The 602 sells for about \$1,000/channel, from 12216 Parklawn Drive.

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What is it?

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Computerworld's August 30th Minicomputer Supplement will cover the field — and it will be read by people who use the Mini:

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Data Briefs

Data 100 Batch Terminal Can Handle Variety of CPUs

MINNEAPOLIS — A new Series 74 Batch Terminal has been introduced by Data 100 Corp. to augment the Series 70 Batch and Series 78 Programmed Terminal lines.

The units can communicate with a variety of CPUs, including those of IBM, CDC and Univac, according to Data 100. The series has an optional CRT for monitoring terminal and CPU status; one-year lease prices start at \$965/mo, including maintenance.

The units also feature transmission speeds up to 4,800 bit/sec, line printing up to 400 line/min and card reading at 300 card/min Data 100 said.

Deliveries start next month from 7725 Washington Avenue South, 55435.

Sycor Terminals Get Modem

ANN ARBOR, Mich. — Sycor, Inc. has introduced its Model 3460 modem for use on "any Sycor terminal" which requires Bell 202C compatibility. The unit will lease for \$25/mo, including maintenance.

The 3460 operates in asynchronous mode, up to 1,200 baud over the public switched network and, when used with the 3465 communications option on the Sycor 340 terminal, can operate synchronously at the same speed.

Deliveries are set for mid-August, from 100 Phoenix Drive, 48104.

Sangamo Adds Data Station

SPRINGFIELD, Ill. — Sangamo Electric Co. has expanded its family of low-speed modems with a 300 bit/sec, answer-only 113B-type data station, compatible, the company said, with Bell or Sangamo 101C, 103A2, 103E and 113A data sets. The unit is also interchangeable with the Bell 113B.

The station costs \$6,800 for a full enclosure with 20 channels. Prepurchase evaluations are available, with production units set for October, from P.O. Box 3347, 62708.

Graphics Systems for Clustered Use

BOSTON — A new series of computer graphics systems, Adage/200, has been announced by Adage, Inc. Designed for clustered multiterminal applications, the series combines a display list form of picture description with a raster display.

An intelligent display list processor, plus MOS technology, permits picture storage, display and interaction at each terminal, without host computer involvement, Adage said.

Initial deliveries are scheduled for the first half of 1973, and in typical clusters the units will cost around \$7,000, from 1079 Commonwealth Ave., 02215.

Satellites Transmit to 370

S/3 'Cluster' Streamlines Bank Data

By Ronald A. Frank
Of the CW Staff

CHARLOTTE, N.C. — A statewide network of satellite CPUs transmitting data to a 370/155 has helped the First Union National Bank streamline its financial reporting methods. The system is operated for the bank by First Computer Services Inc.

Using System/3 computers at regional centers as front-end processors to the 155 in Charlotte, the bank has implemented what it calls the "cluster concept" of processing.

The S/3 CPUs are connected to the Model 155 via conditioned voice-grade private lines and transmit data at 4,800 bit/sec, according to a bank spokesman. The 370 uses 2701 controllers, each with two ports. The S/3s use the standard binary synchronous communications adapter feature.

No Special Routines

Rixon modems were chosen because of the diagnostic indicators on the front of the unit which allow the operator to monitor the status of the line, a bank spokesman said. Even though the bank is



About 8 p.m. daily, the satellite S/3s begin transmitting the item data to the 370/155 in Charlotte.

transmitting at a relatively high data rate, no special error-correcting routines had to be written by the bank. "We use the error-correcting capabilities available with Hasp running under full OS," the spokesman said.

The First Union system includes three regional S/3s with two more scheduled to begin operation soon. Individual branch banks use Micr-encoding stations to add dollar amounts to checks.

These documents are then sent to the regional centers where the data is entered into the satellite processors via IBM 1419 Micr reader/sorters which can handle 1,600 document/min, according to IBM.

The S/3s store the Micr data read from checks on the system disk together with program-generated information such as batch and sequence numbers. This information is then used for automated account analysis which is performed later on the Model 155.

At about 8 p.m. daily each S/3 begins transmitting stored data to the 370/155. Bank officials estimate it will take about an hour for all five of the projected satellite processors to send their data to the 370. This is based on a "typical" workload of about 100,000 items handled daily by the S/3 in Asheville.

Edit List Generated

To save time, the satellites transmit data before their entry runs are balanced and the rejected items reentered. Therefore, the S/3s must transmit corrections to Charlotte. The 370 automatically generates an edit list of all items corrected. This is printed on the S/3 at the appropriate regional center, via remote job entry without operator intervention. Then the satellite approves the corrections.

The 370 collates the mixed items into the proper categories (savings, installment, loans, etc.), and writes the report data on magnetic tape for maximum transmission speeds.

The reports, covering demand deposit and savings trial balances, transaction journals and statements, are transmitted to the corresponding satellite CPU and printed out prior to 6 a.m. the next morning.

In addition, the 370 system balances the tellers' cash, and can analyze workloads, by time of day and overall, as well as pinpoint machines doing inferior Micr encoding and similar analyses, the bank said.

While the bank looks on the S/3s as essential regional processors, batching data for entry into the 370, all master files will be kept in the main CPU, the bank spokesman said. The regional processors are "dislocated slave readers and printers," the spokesman said.

Upgrades to the system under consideration include an increase in data speed to 7,200 bit/sec.

In addition, the bank may add a 3705 front end to the 370 to replace the 2701s, a spokesman said. Further down the line, the regional branch banks could be connected on-line to the S/3 when enough transactions make such a system feasible, the spokesman said.

The 370 system includes Calcomp disks and the CPU is on third-party lease, the bank said.

33, 35 TTY Users Can Cut Rentals With Independents, Study Finds

MAHWAH, N.J. — Most users of Model 33 and Model 35 teletypewriters can save on monthly rental charges by switching from the telephone company to non-regulated terminal suppliers.

This is the conclusion of a study by Western Union Data Services Co. of TTY rates in the Bell System operating companies. The Data Services study showed that Model 33 ASR users can save on monthly rates in at least 30 of the 48 contiguous states and the District of Columbia, and Model 35 users can save in at least 32 of the states. Data on eight states was not available, a spokesman said.

The findings are based on a study of Bell System tariffs for Data-Phone or dial-up teletypewriter services. As part of the TWX network sale agreement, AT&T has said it will not provide TTYs on dial-up services for five years, and independent suppliers such as the Data Services Co. are now providing these units to users, often at lower rates than the phone company.

One Uniform Rate

Although Bell System rates may differ by state, Data Services Co. has one uniform nationwide rate. In addition to getting TTYs for the same price in all locations, the user renting equipment from the independent company receives

one bill compared with the multiple bills he would get from each Bell System operating company in his network.

The Data Services Co. is a subsidiary of Western Union and as an independent supplier it can install teletypewriters only with AT&T Data Access Arrangements (DAAs). But even with the cost of the DAA, the user can save up to \$30/mo compared with Bell rates, the study found.

In New York, a Bell user would pay \$109.66/mo for a Model 33 ASR unit while the same terminal from Data Services would cost \$75/mo. The DAA would add \$4/mo, so the user of independently supplied TTYs would pay \$79/mo or a savings of \$30.66/mo the study showed.

The same terminal for a user in California would cost \$89.25 from Bell and \$79.50 from Data Services. The additional 50 cents is caused by the higher DAA price in California, a Data Services spokesman said.

For the user considering Data Services equipment some minor contract differences are involved. Data Services requires a minimum contract of 90 days after which a rental can be cancelled on 30 days' notice. Bell System companies require the user to sign up for 30 days minimum after which a rental can be terminated on only a one-day notice.



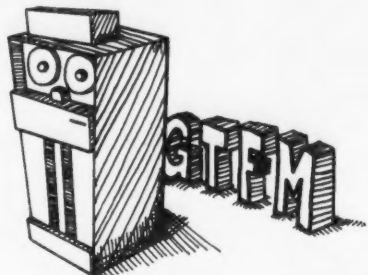
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Air Patrol Sees Computer in Its Future

MONTGOMERY, Ala. — Today the Civil Air Patrol's (CAP) mission is threefold: furthering the cause of aerospace; preparing future aerospace leaders through its cadet program; and flying search and rescue missions for lost and downed planes and assisting military and civil authorities during natural disasters.

CAP is a relatively small organization. At the end of 1971, it had 37,415 senior members, of whom 18,208 were pilots. The rest of the membership consisted of 32,802 cadets under 21.

Recognition for CAP accomplishments for all members is a speedy process.

The CAP members have their status kept up to date on virtually a daily basis by the data processing center at CAP national headquarters.

A computer also keeps the records for the educational materials center that provides members with learning materials, as well as with insignia, uniforms and other paraphernalia.

The computer center staff is working toward more sophisticated applications to permit CAP commanders and their Air Force advisers to make important management decisions.

Not the least of these, said Col. F.W. Lucterhand, deputy chief of staff for personnel, will be how best to achieve CAP's goal



Air Force Lt. Col. Patricia M. Doyle, director, CAP Personnel & Data Systems, confers with Leo R. Meany, DP manager for the Civil Air Patrol national headquarters at Maxwell Air Force Base.

of an annual membership increase of 8%. What kinds of people join CAP? Why do some let their membership lapse? How effective is the variety of training programs? The computer may help supply answers to these and many other questions.

"We already have much of the data base we need," noted Leo R. Meany, CAP DP manager. "Furthermore, it is maintained on magnetic disk files which permit us to sort electronically on a random-access basis."

The files are part of an NCR Century 100 system, he continued, which has a dual-spindle unit that puts two packs with more than 8.3M characters of data on-line to the 32K CPU. Input is achieved with an integrated punched card reader and with a free-standing one, output with a printer rates at 450 alpha and 900 numeric line/min.

A magnetic profile of each member is maintained on a disk pack. Included is such information as his wing (state), squadron and unit, name and address, age, sex, pilot rating, occupation, CAP rank, membership status and date for annual renewal.

When any change is mailed or phoned into the center, the information is keypunched into binary coding and input at random. The computer searches the disk pack for the correct file and amends the magnetic encoding. In the case of a promotion or award, the computer then prints the appropriate certificate.

Heavy Input

The computer center processes about 1,200 new applications for cadet membership each month, Meany said, and about 800 for senior membership. These and changes in status — promotions, awards and new addresses — require an average of 1,000 card inputs each working day, he estimated.

"We're well-satisfied with the job the computer is doing for CAP today," Lucterhand said.

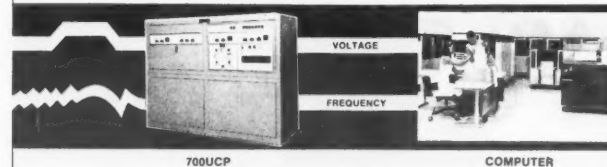
"But what we're looking forward to are the intangible benefits which will accrue now that we've got the basics. This data processing system is oriented toward the production of management information, and that's what CAP must have if it is to continue to serve the nation as it has for the past three decades."

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Computer maps decorate the office of Dr. Robert I. Wittick, assistant professor of geography at MSU's Computer Institute for Social Sciences Research.

His maps of Michigan show population changes for the state by counties, and a contour map of Michigan shows percentages of population change from 1960 to 1970.

Another map, produced by the computer as an azimuthal projection, shows the world as a

sphere with the U.S. curved over one area of it.

"Computer mapping removes the drudgery of drafting by hand," Wittick said. "Once we have programmed the computer, it gives us a map showing the data we want in a few minutes."

The computer-mapping programs at MSU are designed as instructional and research tools, Wittick said.

Besides the various basic mapping programs prepared at MSU, the computer software includes a 6,000-card program of worldwide maps made available by a U.S. government agency.

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the information and produces maps on which the data appears in relation to space.

The computer maps come in two kinds of printouts — either the "line printer map" on regular computer printout paper, or the "pen and ink plotter maps" which include the block diagrams that show data like rainfall patterns in 3D form on regular drafting paper.

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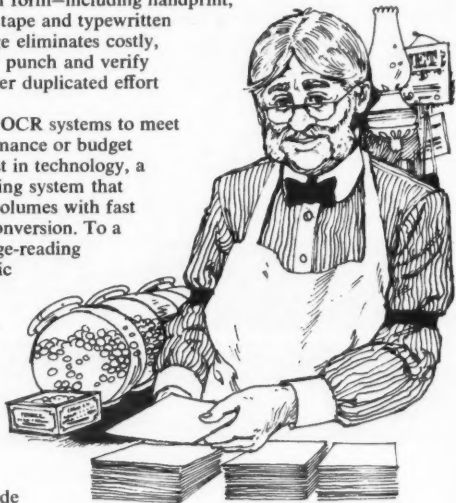
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August 9, 1972

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CI Notes

Sperry Rand Happy With RCA

PHILADELPHIA — "Results to date of the RCA transaction are indeed gratifying and are even better than our expectations," Sperry Rand Corp. President Robert E. McDonald told stockholders at the recent annual meeting here.

"We have lost no major customer accounts since we took them over. The erosion was much less than we anticipated," observed Chairman J. Paul Lyet.

Customers have increased their add-on equipment commitments offered under the original agreement by \$27 million, he said.

The firm will continue to support government programs, including defense contracting, although two former missile plants are now doing commercial computer work, Lyet said. At the meeting, a Quaker group suggested forming a committee on economic conversion, to disengage Sperry Rand from defense work.

Pertec Ponders Distributors

LOS ANGELES — Pertec Corp. is investigating marketing its KT 1000 series data terminals through regional distributors selling direct to end-users.

"As we learn more about the data terminal market, we see that there is a significant segment that OEMs and system manufacturers do not normally reach," observed Geoff Taylor, manager of corporate market planning.

CDC Adds Maintenance Firm

MINNEAPOLIS — Control Data Corp. has agreed to acquire Syntonic Technology, Inc., a maintenance service organization.

The agreement calls for the issuance of one CDC share for every four-and-a-half shares of Syntonic common, and for CDC to assume Syntonic's outstanding 6-1/2% convertible subordinated sinking fund debentures due 1989, as well as its outstanding stock purchase warrants. The agreement is subject to approval by Syntonic Technology stockholders.

Ampex Gets Loan

REDWOOD CITY, Calif. — Ampex Corp. has secured a new long-term loan agreement with its lenders, which extends the firm's credit until July 31, 1974. The new agreement replaces an interim arrangement that began in April.

Supershorts

Federal Marketing Counsellors, Inc. has been formed to provide companies with guidance and advice in their approach to the Federal ADP marketplace. Located in Arlington, Va., the firm offers such services as marketing strategy, marketing research, including media analysis, solicitation analysis and proposal assistance and evaluation.

Westinghouse delivered the first data processor for the U.S. Navy's Harpoon missile system to McDonnell Douglas within three months of the original contract award. Interchangeable printed circuit cards adapt the processor to both airborne and shipborne control of the missile.

Three Data General Corp. Nova mini-computers will be on display at the Canadian Solo Fair in Peking Aug. 21 to Sept. 2. The Novas, two 1210s and a 1220, were built by Datagen of Canada, Ltd.

Bell Waits in Wings

FCC in Middle of MCI-WU Rate Battle

By Ronald A. Frank
Of the CW Staff

WASHINGTON, D.C. — The "gullible majority" of the Federal Communications Commission has bowed to the "gimmicky manipulation" of its rules by Western Union, according to FCC Commissioner Nicholas Johnson.

Analysis

In a blistering dissenting statement, Johnson blasted his fellow commissioners for a recent ruling granting "special permission" to Western Union to lower its private line rates to match those of Microwave Communications Inc. (MCI), the new specialized common carrier offering its first service between Chicago and St. Louis.

"It is time that competitors [like MCI] who believe they are injured by allegedly

predatory behavior of [existing common] carriers... look to the antitrust laws for relief," Johnson said.

At issue is the recent FCC decision ordering a hearing on the Western Union rate cuts. The hearings, scheduled to begin early next year, were not coupled with a commission suspension of the proposed lower rates. So until the hearings are held, and a further decision is forthcoming from the FCC, Western Union will presumably be allowed to duplicate the rate offerings of MCI.

But the real competitor waiting in the wings seems to be AT&T. "Western Union is widely viewed in the industry as a stalking horse for Bell," Johnson said. And once the lower rates are approved, the "commission will be compelled to do for Bell what it has done for Western Union," he predicted.

Several industry sources agree with Johnson that the Western Union rates matching MCI's offerings were instigated

by Bell. These sources claim Bell informally proposed similar rate cuts on its Chicago-to-St. Louis routes earlier this year only to be rebuffed by the commission staff. Seeing little hope of getting its

MCI Statement

The following is MCI's statement in response to the recent FCC ruling on the WU rate filing:

"MCI has long championed competition — fair competition, not competition involving cross subsidization by use of income from monopoly services to underprice unfairly competitive services.

"The company agrees with the FCC when it stated that 'one of the questions raised by this filing is whether the offering is or will be a burden on or significantly detrimental to Western Union's other services.'

"MCI believes this subject is important and the company will participate in any hearing that may ensue. The FCC also recognizes the importance of the hearing by stating, 'we are instituting an investigation and hearing to determine the cost competitive and other considerations underlining Western Union's new rate offering, its relationship to the other nationwide offerings of Western Union, and whether in any respect, the tariff is or will be unjust, unreasonable or discriminatory or preferential.'"

competitive rates approved, Bell went to Western Union, according to these sources.

The FCC ruling has again put the commission in the position of allowing rates to go into effect without ruling on their validity, especially with regard to competitive impact. Recent FCC orders on modem price reductions and other data communications services have also been allowed to take effect pending further study.

At least one organization, the Independent Data Communications Manufacturers Association feels such de facto rate reductions should be stopped. "... the parties suffering from [an] unlawful tariff must endure the impact of the tariff throughout the lengthy [FCC] administrative process," according to Arthur Carr, vice-president of IDCMA [CW, Aug. 2].

There are those who point out that the Communications Act of 1934, which created and now governs the FCC, is really to blame. These regulatory experts feel the act needs to be overhauled so the FCC cannot allow proposed rates to take effect without ruling on their merits.

The regulatory experts note the Common Carrier Bureau of the FCC staff is not a politically popular bureau. And by comparison, the Broadcast Bureau, which regulates radio and TV, maintains a much larger staff to make recommendations to the commission on important issues. Additionally, few of the FCC commissioners have first-hand experience with common carrier problems, these experts claim.

The important question remains: under what terms can monopolistic common carriers compete with commercial suppliers on an equal basis?

Johnson feels the matter will have to be decided by the Justice Department. If the commission is unable to resolve the issue, this may well be where MCI and the independents must go to seek help.

Independents Affirm 360 Appeal In Reaction to IBM Announcement

By Molly Upton
Of the CW Staff

NEWTON, Mass. — After much speculation over the content and an intense court battle waged by Telex to prevent the IBM announcement, the independent memory makers and lessors were generally cautious in their initial evaluations, reaffirming the continuing popularity of the 360.

"I am delighted to have the announcement finally made. I don't think there's anything worse in the industry than to have a major announcement that's rumored but not made," noted Roger Goetz of Computer Investors Group.

"None of the products CIG is marketing is directly affected," he added, explaining that the products, including Data Recall memories, are aimed at the 360 line and the 370/155 and 165. "We will have to look at the migration to the new machines in the future," he added.

'No Great Effect'

Jim Benton of the Computer Lessors Association said: "I think our equipment is going to continue to be every bit as price competitive as it was before.... I

don't think this announcement is going to have that great an effect on our marketplace.

"The practice of adding on memories to 360s will continue, and DP managers looking for the least expensive method of running an installation are still going to turn to the 360," he observed. The association is comprised of lessors whose principal inventory is 360s and related equipment.

While the CPU price of the 158 and 168 is attractive, continued Goetz, the cost of supporting virtual memory will have to be considered by the user. "The user is pretty sophisticated, and he'll realize it's not a dollar-for-dollar trade," he said.

IBM appears to have bundled some of the cost of the memory in with the CPU price, he observed, adding that the cost of doubling memory was less on a 158 than on a 155.

Unanswered Questions

"There are a number of unanswered questions," observed Gary Freedman of Intel Corp. "It also appears as though IBM is trying to price the 158 in a way that is disadvantageous for anyone other than themselves, but I think Telex has already taken them to task for that in terms of policy. It looks like some of the memory is bundled, but you can't tell without prices," he added.

"It appears as though what IBM just announced is what it announced it had in 1964. The 360 was supposed to do all this."

Intel said it could not speculate on what effect the latest move would have on its memory and controller market until it had prices.

The announcement "looks like an attempt on IBM's part to lock us out of the market, but we don't think that will work," Freedman added.

Electronic Memories and Magnetics is waiting for customer reaction. "At this point we do not see a market in the new 158 and 168." But it "has not been proven that the internal speed of the new system produces greater throughput," a spokesman said.

Telex declined comment as it still has court action pending.

Mainframers' Tax Filings Disregard SEC Rules: Vanik

WASHINGTON, D.C. — Rep. Charles A. Vanik (D-Ohio) has charged IBM, National Cash Register and RCA with disregarding Securities and Exchange Rules on disclosure of income and excess profits tax.

In Vanik's study of 145 of America's largest corporations designed to highlight "questions of corporation tax policies and inequities and distortions created by some of the tax subsidies which have been enacted," the three corporations are listed as combining their foreign and federal taxes in all public records, including their 10-K forms.

This is in contradiction to SEC rule 5-14.15, he said, which requires that: "first, federal income taxes — normal and surtax; second, federal excess profits tax; and third, other income taxes — state, local and foreign — be stated separately.

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CES Offers Low-Cost Document Reader

SILVER SPRING, Md. — Computer Entry Systems Corp. is offering its low-cost, hand-fed CES 7100 Document Reader to OEM users.

The reader, which had previously been incorporated into the company's 8200 key entry system, is intended for the low-volume OCR user and can be adapted to remote terminal use.

The standard unit can read OCR-A numeric characters as well as C, N, S, T, X, Z, "hook," "chair" and "vertical bar." Since the font selection is related to the unit's programmable ROM, the set can be adapted to a customer's needs, the firm said.

Standard options include the full alphanumeric OCR-A size 1 font, handprint numeric, OCR-B and 1403 numerics, mark sense, check digit and a numeric keyboard.

The reject rate of the CES 7100 is less than one in 10,000 on nominal print quality and substitution rate is less than one in 50,000 on nominal print quality, the company said.

The device can accommodate documents from 3 in. to 9 in. long and 2 in. to 6 in. wide. Normal read rate is about 30 document/min with a single line of data read per pass.

The unit costs \$4,450 in lots of 100. Delivery is 90 days from 2141 Industrial Parkway, 20904.

Other New Products

Lockheed Electronics Data

New OEM Products

Products Division has announced that the auto load option of the MAC 16/MAC Jr. minicomputers is now offered as a field-programmable ROM. Programming is done by inserting a

"one" in a word in the 64-word by 16-bit diode matrix. It is priced at \$550.

The PDC 4200 digital cassette tape transport from Peripheral Dynamics Corp., Anaheim, Calif., provides up to 8M bits of storage and can be operated at from 10- to 75 in./sec.

Telefile Computer Products, Irvine, Calif., has a DC-10 Disc Controller for interfacing IBM 2311-, 2314-compatible disk drives to DEC PDP-10 computers. It is priced at \$23,500.

Lockheed Criticized for Exporting Assembly of Safeguard Core Stacks

WASHINGTON, D.C. — Lockheed Electronics' role in the Safeguard ABM project has been criticized in Congress here because the firm is having core wiring jobs done in Hong Kong. Sen. Vance Hartke (D-Ind.), one of the sponsors of the Burke-Hartke bill which would try to keep firms from exporting work overseas, criticized Lockheed for constructing core stacks for the Safeguard's computer systems in Hong Kong.

The value of the work being done in Hong Kong amounts to around \$600,000, Defense Department officials said in response to the charges.

Assembly Done Abroad

Lockheed is a subcontractor to Western Electric with a contract to build the core memory stacks. All of the components are made in the U.S., but the final assembly, wiring the cores into frames, is being done in the Hong Kong facility.

According to Jim Quillen, president of local 727 of the International Association of Machinists who was quoted by Hartke, the action is "a slap in the face for every jobless American. The action ignores completely the urgent needs of hundreds of thousands of unemployed aero-

space and electronics workers in this country."

He also charged that the wage rate in the Hong Kong plant was just slightly over \$2/day.

In reply to Hartke's charges, the Defense Department noted the total contract with Lockheed is approximately \$16 million and that the amount of the work done in Hong Kong is just over \$600,000.

"It is estimated that it would cost approximately six times the Hong Kong costs to have this same work done in the U.S.," the Defense Department said.

"Prior to permitting the contractor to have this assembly work performed outside the U.S., the Army reviewed applicable laws and regulations. It was determined that the assembly effort in Hong Kong is not in contravention of either the Buy American Act or the Balance of Payments Program.

"In consequence, the Army reached its determination to permit this limited amount of assembly work to be accomplished outside the U.S. on the basis of the substantial budgetary savings that would accrue to the U.S. Government. None of the effort which is accomplished in Hong Kong is classified," the Defense officials said.

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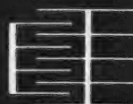
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Core Market Seen Reaching \$150 Million

MARINA DEL REY, Calif. — Ampex is claiming the lead in the number of bits installed on IBM computer systems.

The firm said that out of more than 2.6 billion bits of independent memory storage for IBM 360 computers, it has installed around 2 billion, or 77% of the total.

Since the first replacement core memory from an independent in 1969, Ampex said the value of such installed memory has risen to almost \$80 million in terms of original purchase price.

Ampex Value

While it claimed a commanding lead in terms of bits installed, Ampex noted that "because the majority of the Ampex memories supplied are large extended core memories with lower per-bit cost than mainframe memories, the Ampex portion of the total value of 360 independent core memories is approximately \$33 million, or 40% of the total. In addition, Ampex said the

360 core memory replacement business should continue for several years with shipments exceeding 5 billion bits with a value of \$150 million.

Ampex also said the 370 replacement memory market should pass the \$1 billion mark, based on industry estimates of a \$10 billion mainframe market — with the independents grabbing a 10% share of the market.

There are other factors, however, that could make the market for 370 replacement memory even larger, the firm indicated.

First, it said, 370 replacement memories are available now, less than 16 months after the first installation of the 370, while the first 360 replacement units were not installed until four years after the introduction of the 360 series.

Secondly, the firm said data processing managers now have a greater awareness of and confidence in independent memories because of the successes re-

ported with 360 replacement memories over the past five years.

Thirdly, because the memories of the 370 are larger than those for the 360 this will increase the size of the market for the independents, the firm claimed.

Although 360 extended core memories have 1M byte capacities, Ampex explained, most 360 mainframe memories are less than 128K bytes. At the same time, the 370/155 and 370/165 have 2- and 3-M byte mainframe memories, Ampex noted.

Ampex also claimed the number of 370s produced by IBM will be double the number of 360s over the life of the series, which will open up even larger markets for the equipment manufactured by the independent memory producers.

Itel Lands Federal Leasing Pact

WASHINGTON, D.C. — Itel Corp. has been awarded a lease contract by the Federal Bureau of Investigation for replacement of two IBM 360/65s and a

for the government's new Honeywell H-6000s.

Alan M. Voorhees & Associates, Inc. has been awarded a contract from the West Virginia Department of Highways to develop a coordinated data system for highway planning.

Contracts

360/50 and other equipment in the National Crime Information Center. The value of the equipment being replaced, at IBM sale price, is \$8.8 million, Itel said.

The bid was for a monthly rental charge of \$182,027 excluding extra use charges.

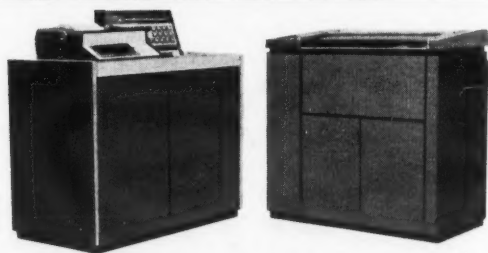
Other Contracts

Advanced Computer Techniques has received a three-year software contract from the Hungarian Government. The award, valued at \$450,000, is for systems analysis and programming

Eldorado Electrodata Corp. has received a \$340,000 contract from Kelly Air Force Base for its Model 650 nsec Digital Delay Generators.

Capital Bank & Trust Co., Boston, has selected Moll Associates, Inc. to design, install and operate its data processing center.

Ferranti's Electronic & Display Equipment Division will supply an automatic message-switching system for aeronautical use at London's Heathrow Airport.



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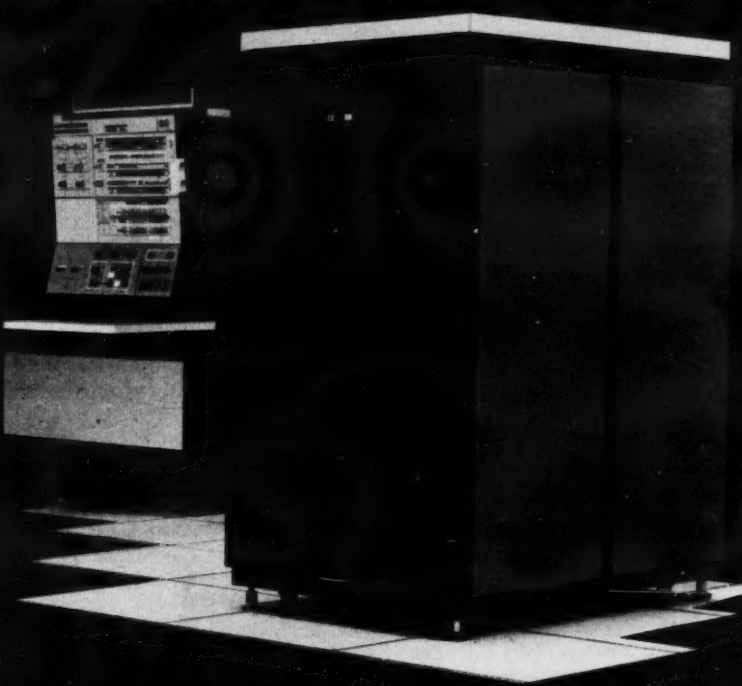
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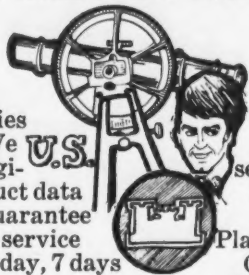
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THE AUTHORS

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Reid Henderson is President of Computemics, Inc., and is both a CPA and CDP. He also lectures at George Washington University and the Industrial College of the Armed Forces.

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Despite Record Revenues

Mohawk Sets Year Loss at \$765,000

HERKIMER, N.Y. — Mohawk Data Sciences (MDS) chalked up record revenues in the year ended April 30, but turned in a loss of \$765,000 for the period, hindered by heavy start-up expenses on the System 2400 and the establishment of reserves.

The loss for the previous fiscal year (for nine months) was \$1.1 million on revenues of \$67.9 million.

Revenues reached a record \$119.8 million, of which \$64 million, or 53%, were attri-

butable to rental and service income. The \$765,000 loss includes an extraordinary charge of \$295,000.

In the nine-month report, MDS showed earnings of \$1.6 million, or 28 cents a share.

Adjustments for inventory reserves, rental equipment valuation and other year-end items reduced pretax income \$2.3 million, according to President Richard P. Rifenburgh. The firm also revised certain depreciation and inventory procedures,

effective May 1, 1972.

Termination of operations at a Massachusetts manufacturing facility resulted in an extraordinary charge of about \$485,000, the firm said.

End-user backlog stood at \$55 million at the end of April, of which "more than half represented System 2400 and related systems," based on sales prices, Rifenburgh observed.

"During fiscal 1972, the expenses 'directly attributable to the System 2400 — in building a systems-oriented sales, service and support organization to effectively market this new family of DP systems — totaled approximately \$10 million.' Revenues from the new system were 'modest,' he noted.

"It has always been MDS' policy to reflect the costs of new business expansion directly in current earnings. Even in the face of a changing revenue mix between rental income and outright sales, we have again reviewed this policy and believe it the wiser course to continue to do so," Rifenburgh added.

Interdata Sees Record 6 Months Helped by Strong Second Period

OCEANPORT, N.J. — Spurred by strong sales in the second quarter, minimaker Interdata Inc.'s six-month report was the best in the company's history, and quarter earnings more than doubled from those registered in the 1970 period.

In the quarter ended June 30, revenues rose to \$3.1 million from \$2.2 million in the same period last year. President Daniel Sinnott estimated that sales rose about 50% for the period.

Earnings before special credits were \$131,300, or 7 cents a share, compared with \$16,100, or 1 cent a share in the same 1971 period. With the addition

of tax-loss carryforward benefits, earnings reached \$253,100, or 13 cents a share, up from \$107,400, or 6 cents a share.

In the six months, revenues rose to almost \$6 million from \$3.6 million in the year-ago period. Earnings, with a \$268,700 extraordinary credit, were \$463,800, or 25 cents a share, compared with last year's loss of \$111,100 or 6 cents a share.

"This accelerated rate of growth and profitability stems largely from the continued high-order rate for our New Series of minicomputers, combined with substantially improved profit margins," noted Sinnott.

Data Products Earns \$349,000 in Quarter

WOODLAND HILLS, Calif. — Data Products Corp. is continuing the trend toward profitability begun last year.

In the first quarter ended June 24, earnings totaled \$349,000, or five cents a share, compared with \$90,000, or 1 cent a share in the corresponding 1971 period. Revenues rose to \$13.9 million from \$13.4 million.

The 1971 earnings include a \$163,000 tax-loss carryforward.

Backlog of firm orders is now over \$24 million, according to President Graham Tyson, who noted that debt has been reduced by "more than \$3 million since the beginning of the year and deferrals have been reduced as planned."

Several new products are planned for introduction later in the year, the firm said.

UCC Unit Registers Quarter Loss

DALLAS — A \$48,000 operating loss and \$2.6 million interest expense incurred by University Computing Co.'s computer operations in the second quarter were offset by the \$3.6 million earnings from the firm's insurance operations.

In the quarter ended June 30, UCC earned \$841,000, or 10 cents a share, compared with \$2.4 million, or 31 cents a share in the year-ago period.

Lower revenues primarily in equipment rental operations, and higher costs were chief factors in the computer operations results, according to President

Charles J. Wyly Jr.

UCC repurchased some equipment in July to modify previous contractual agreements and recorded a pre-tax loss of about \$1.3 million, of which about \$665,000 will be reflected in third-quarter results of computer operations, according to Wyly.

In the six months, the firm earned \$12.7 million, or \$1.50 a share, up sharply from \$4.1 million, or 54 cents a share in the year-ago period. In the first quarter of this year, the insurance operation's capital gains of \$10.6 million substantially boosted earnings, Wyly said.

CIG Has Record Earnings

STAMFORD, Conn. — Computer Investors Group, Inc. has turned in record first-quarter earnings for the three months ended June 30.

Revenues totaled \$3.9 million compared with \$3.1 million in the same year-ago period. Earnings rose to \$587,899, or 27 cents a share, up from last year's restated \$510,970, or 25 cents a share.

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SOFTWARE & EDP SERVICES

O	ADVANCED COMP TECH	1- 2	2 1/4	- 1/8	-5.2
A	APPLIED DATA RES.	4- 7	5 3/8	+ 3/4	+16.2
O	APPLIED LOGIC	1- 4	2 3/4	- 1/8	-4.3
N	AUTOMATIC DATA PROC	72- 99	96 1/4	-1 3/4	-1.7
O	BRANDON APPLIED SYST	1- 2	1 1/8	- 1/8	-10.0
O	COMPUTER DIMENSIONS	8- 14	7 1/2	-1 1/2	-6.2
O	COMPUTER DYNAMICS	1- 4	1 1/4	0	0.0
O	COMPUTER NETWORK	4- 7	6 1/2	+1 1/4	+23.8
N	COMPUTER SCIENCES	6- 10	6 1/4	- 5/8	-9.0
O	COMPUTER TECHNOLOGY	6- 8	3 1/2	-2	-36.3
O	COMPUTER USAGE	9- 14	10	+ 1/4	+2.5
O	COMP AUTOMOT REPORTS	5- 9	5 1/4	0	0.0
N	COMPUTING & SOFTWARE	15- 28	15 5/8	+ 7/8	+5.9
O	COMRESS	1- 3	1 7/8	+ 1/8	+7.1

O	COMSHARE	5- 10	6 3/8	0	0.0
O	DATATAB	5- 9	5 1/2	0	0.0
O	EDP RESOURCES	3- 8	4	+ 1/4	+6.6
A	ELECT COMP PROG	2- 5	2 1/8	- 1/4	-10.5
N	ELECTRONIC DATA SYS.	43- 65	55 1/4	+2 1/8	+4.0
O	INFORMATICS	6- 11	6 1/4	- 5/8	-9.0
O	I.O.A. DATA CORP	1- 3	2 1/8	- 3/8	-15.0

A	ITEL	7- 12	7 3/8	- 3/8	-4.8
O	KEANE ASSOCIATES	4- 7	4 1/4	0	0.0
O	KEYDATA CORP	7- 13	11 3/8	-1 3/8	-10.7
O	LOGICON	4- 9	6 7/8	0	0.0
A	MANAGEMENT DATA	6- 10	5 7/8	0	0.0
O	NATIONAL CSS INC	8- 26	26	+3 5/8	+16.2
P	ON LINE SYSTEMS INC	8- 20	20 1/8	+1 1/2	+8.0

N	PLANNING RESEARCH	10- 17	11 7/8	+2	+20.2
O	PROGRAMMING METHODS	20- 24	20 7/8	+ 3/8	+1.8
O	PROGRAMMING & SYS	1- 2	1 3/8	- 1/2	-26.6
O	SCIENTIFIC COMPUTERS	2- 4	2 3/8	0	0.0
O	SIMPLICITY COMPUTER	1- 5	3 1/8	0	0.0
O	TBS COMPUTER CENTERS	4- 6	4 3/4	0	0.0
O	TRACOR COMPUTING	2- 3	1 5/8	- 1/8	-7.1

O	TYMSHARE INC	7- 10	9	+1 1/4	+16.1
O	UNITED DATA CENTER	5- 8	6 1/2	0	0.0
N	UNIVERSITY COMPUTING	14- 26	13 1/2	-3 7/8	-22.3
A	URS SYSTEMS	6- 10	7 3/4	0	0.0
O	VORTEX CORP	2- 5	3 1/4	+ 1/2	+18.1

PERIPHERALS & SUBSYSTEMS

N	ADDRESSOGRAPH-MULT	34- 49	48 3/8	+1 3/4	+3.7
O	ADVANCED MEMORY SYS	12- 23	16 1/8	- 7/8	-5.1
N	AMPEX CORP	6- 15	6 1/2	- 1/2	-7.1
O	ANDERSON JACOBSON	5- 8	5	0	0.0
O	ATLANTIC TECHNOLOGY	1- 11	1 3/4	-1	-36.3
A	BOLT, BERANEK & NEW	5- 21	17 1/4	+ 3/8	+2.2
N	BUNKER-RAMO	9- 14	10 7/8	- 3/8	-3.3

A	CALCOMP	17- 25	17 3/8	- 1/4	-1.4
O	CENTRONICS DATA COMP	11- 53	46 1/2	-1 1/2	-1.0
O	COGNITRONICS	3- 5	3	- 3/4	-20.0
O	COMPUTER COMMUN.	1- 7	2 1/2	+ 3/4	+42.8
A	COMPUTER EQUIPMENT	3- 4	3	- 1/8	-4.0
O	COMPUTER MACHINERY	7- 13	10 1/2	+1 1/2	+5.0
A	COMPUTEST	5- 9	5	- 1/8	-2.4

A	DATA PRODUCTS CORP	4- 7	4 1/8	- 1/8	-2.9
O	DATA RECOGNITION	2- 5	2 1/4	0	0.0
O	DATA TECHNOLOGY	3- 5	2 3/4	0	0.0
O	DI/AN CONTROLS	0- 8	5 5/8	0	0.0
O	DIGITRONICS	2- 4	2 1/4	+ 1/2	+28.5
N	ELECTRONIC M & M	5- 8	5 1/8	- 1/8	-2.3
O	FABRI-TEK	2- 5	3 1/8	0	0.0

O	GENERAL COMPUTER SYS	7- 16	12	+ 1/2	+4.3
N	GENERAL ELECTRIC	59- 70	64 3/4	+1 3/4	+2.7
N	HAZELTINE CORP	9- 13	9	- 1/2	-5.2
O	INFOREX INC	28- 47	34	0	0.0
O	INFORMATION DISPLAYS	2- 5	1 5/8	- 1/8	-7.1
A	LUNDY ELECTRONICS	9- 14	10	-1 1/8	-10.1
O	MANAGEMENT ASSIST	1- 2	5/8	0	0.0

N	MEMOREX	18- 38	18 1/4	-5	-21.5
A	MILGO ELECTRONICS	17- 44	35 3/4	-1	-2.7
N	MOHAWK DATA SCI	17- 27	16 1/2	0	0.0
O	OPTICAL SCANNING	7- 16	10	+ 1/2	+5.2
O	PERTEC CORP	9- 17	8 3/4	- 3/4	-7.8
O	PHOTON	7- 15	11 1/8	0	0.0
A	POTTER INSTRUMENT	9- 21	10 1/4	-2 3/4	-21.1

O	PRECISION INST.	7- 13	7	- 1/4	-3.4
O	RECOGNITION EQUIP	8- 15	9 1/2	+ 3/4	+8.5
N	SANDERS ASSOCIATES	13- 21	14	0	0.0
O	SCAN DATA	7- 13	7 7/8	0	0.0
O	STORAGE TECHNOLOGY	17- 39	34 3/4	+1 1/2	+1.4
O	SYCOR INC	7- 11	9 1/2	+ 1/2	+5.5
O	TALLY CORP.	8- 15	10 1/4	- 3/8	-3.5

N	TEKTRONIX INC	34- 64	64 3/8	+5 1/4	+8.8
N	TELEX	6- 15	6 1/8	-1	-14.0
O	WILTEK INC	10- 26	18 1/2	0	0.0

SUPPLIES & ACCESSORIES

O	BALTIMORE BUS FORMS	6- 9	5 1/2	- 3/4	-12.0
A	BARRY WRIGHT	9- 14	13 5/8	+1 1/2	+12.3
A	DATA DOCUMENTS	17- 26	20 3/4	+ 3/4	+3.7
O	DUPLEX PRODUCTS INC	8- 16	8	0	0.0
N	ENNIS BUS. FORMS	7- 10	7 1/2	- 1/2	-6.2
O	GRAHAM MAGNETICS	15- 27	18 1/8	+ 1/8	+0.6
O	GRAPHIC CONTROLS	12- 15	13	-1	-7.1
N	3M COMPANY	76- 84	84 1/8	+2 1/8	+2.5
O	MOORE BUS. FORMS	42- 55	53 5/8	+ 5/8	+1.1
N	NASHUA CORP	48- 56	55 3/8	+ 5/8	+1.1

O	REYNOLDS & REYNOLD	37- 77	40	0	0.0
O	STANDARD REGISTER	14- 20	15 7/8	+ 1/8	+0.7

1972 CLOSE WEEK WEEK
RANGE AUG 03 NET PCT
(1) 1972 CHNGE CHNGE

O	TAB PRODUCTS CO	14- 17	16	0	0.0
N	UARCO	23- 28	23 3/8	- 3/8	-1.5
A	WABASH MAGNETICS	8- 11	8 3/8	- 1/4	-2.8
N	WALLACE BUS FORMS	22- 26	23	+ 1/4	+1.0

COMPUTER SYSTEMS

N	BURROUGHS CORP	147-213	213	+13 5/8	+6.8
N	COLLINS RADIO	14- 20	15 3/8	- 1/8	-0.8
N	CONTROL DATA CORP	43- 78	72 1/4	+2 1/2	+3.5
O	DATA GENERAL CORP	56-102	102	+5	+5.1
O	DIGITAL COMP CONTROL	10- 25	10	+1	+11.1
N	DIGITAL EQUIPMENT	72- 97	89 1/2	+6 1/8	+7.3
N	ELECTRONIC ASSOC.	6- 13	9 1/2	+ 1/2	+5.5

A	ELECTRONIC ENGINEER.	7- 14	7 3/4	0	0.0
N	FOXBORO	27- 41	27 1/8	-2 1/8	-7.2
O	GENERAL AUTOMATION	13- 31	31 1/4	+4 3/4	+17.9
O	GRI COMPUTER CORP	3- 5	4	+ 1/4	+6.6
N	HEWLETT-PACKARD CO	46- 77	76 3/4	+5 3/4	+8.0
N	HONEYWELL INC	130-165	164 3/4	+11 1/4	+7.3
N	IBM	333-415	415 1/4	+18 1/4	+4.5

O	INTERDATA INC	8- 16	12 3/8	+ 3/4	+6.4
O	MICRODATA CORP	5- 10	8 1/4	- 3/4	-8.3
N	NCR	29- 35	31 1/4	+ 3/8	+1.2
N	RAYTHEON CO	33- 47	33 1/4	-1 3/8	-3.9
N	SPERRY RAND	30- 46	46	+2 1/8	+4.8
A	SYSTEMS ENG. LABS	10- 16	10 1/4	- 1/4	-2.3
N	VARIAN ASSOCIATES	14- 19	18 1/4	+ 7/8	+5.0

N	VICTOR COMPTOMETER	15- 24	20	+1	+5.2
N	WANG LABS.	35- 61	37 1/4	-1 1/4	-3.2
N	XEROX CORP	121-163	163	+6 1/8	+3.9

LEASING COMPANIES

A	BOOTHE COMPUTER	6- 18	5 1/2	-1 3/8	-20.0
O	BRESNAHAN COMP.	2- 3	1 7/8	- 1/8	-6.2
O	COMDISCO INC	3- 18	15	- 1/4	-1.6
O	COMPUTER EXCHANGE	1- 3	1 3/8	0	0.0
A	COMPUTER INVSTPS GRP	8- 14	10	- 1/2	-4.7
N	DPF INC	5- 13	4 7/8	- 3/4	-13.3
M	DATRONIC RENTAL	3- 4	2 5/8	- 1/8	-4.5

A	DCL INC	5- 10	4 5/8	- 3/8	-7.5
A	DEARBORN-STORM	17- 26	17 1/4	+ 3/8	+2.2
A	DPA, INC.	5- 8	6 1/8	+ 3/8	+6.5
A	GRANITE MGT	7- 11	6 3/4	- 1/4	-3.5
A	GREYHOUND COMPUTER	6- 11	6 1/2	0	0.0
N	LEASCO CORP	17- 24	18 1/2	+1 1/4	+7.2
O	LEASPAC CORP	9- 15	9 1/2	0	0.0

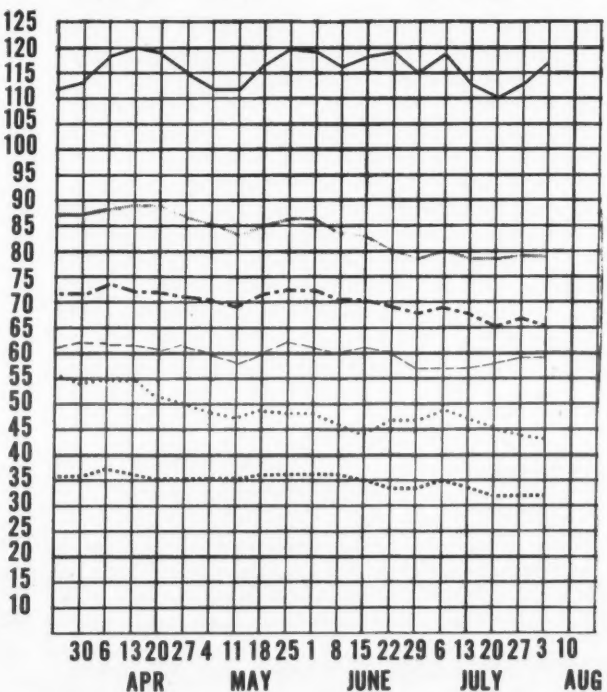
O	LECTRO MGT INC	2- 4	1 1/8	0	0.0
O	NCC INDUSTRIES	7- 11	6 5/8	0	0.0
A	ROCKWOOD COMPUTER	3- 7	2 7/8	- 1/4	-8.0
O	SYSTEMS CAPITAL	3- 20	17 1/4	- 3/8	-2.1
N	U.S. LEASING	19- 33	29 3/8	- 3/4	-2.4

EXCH: N=NEW YORK EXCHANGE; A=AMERICAN EXCHANGE
L=NATIONAL EXCHANGE; O=OVER-THE-COUNTER
P=PHIL-BALT-WASH

O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

Computer Stocks Trading Index

Computer Systems Software & EDP Services
Peripherals & Subsystems Leasing Companies
Supplies & Accessories CW Composite Index



Earnings Reports

IBM			
Three Months Ended June 30			
	1972	1971	
	(000)	(000)	
Shr Ernd	\$2.70	\$2.22	
Revenue	2,364,847	1,942,168	
Earnings	312,197	255,102	
6 Mo Shr	5.34	4.41	
Revenue	4,677,097	3,812,301	
Earnings	617,904	505,910	

HONEYWELL			
Three Months Ended June 30			
	1972	a1971	
Shr Ernd	\$1.81	\$1.52	
Revenue	510,036,000	462,206,000	
Tax Cred	1,643,000	881,000	
Earnings	15,078,000	9,091,000	
6 Mo Shr	1.41	.92	
Revenue	960,231,000	892,654,000	
Tax Cred	1,643,000	881,000	
Earnings	26,302,000	16,070,000	

a-Restated to reflect acquisition on a pooling-of-interest basis.

PROGRAMMING & SYSTEMS			
Year Ended Feb. 29			
	1972	a1971	
Shr Ernd	\$0.04	\$0.10	
Revenue	4,599,093	5,122,908	
Earnings	131,269	326,313	

a-Restated.

MATHEMATICAL APPLICATIONS GROUP			
Year Ended March 31			
	1972	1971	
Shr Ernd	\$0.21	\$(.38)	
Revenue	1,694,712	1,196,025	
Earnings	168,652	(294,128)	

DPA			
Six Months Ended May 31			
	a1972	b1971	
Shr Ernd	\$0.30	\$(.83)	
Revenue	17,913,798	18,096,884	
Earnings	749,847	(1,750,731)	

a-Prior to Dec. 1, 1971, costs of rebuilding DP equipment were capitalized and are being depreciated over the remaining life of equipment. Such costs incurred after that time are expensed as incurred. The effect of this change has been to reduce earnings by \$163,467 or 7 cents per share. b-Restated to reflect change in depreciation method.

FABRITEK			
Year Ended March 31			
	1972	1971	
Revenue	\$13,638,010	\$15,246,078	
Spec Cred	a1,854,879	b32,470	
Loss	672,514	2,801,532	

Epoch 4's best salesman.



It's the 2420.

New, high-speed hardware has made the computer tape business a whole new ball game.

In fact, some conventional tapes are having a tough time keeping up with the new drives. They're supposed to. But they don't.

Epoch 4 does.

As a result, the 2420 sells a lot of Epoch 4 for us.

But, even if you don't have 2420's, you still need Epoch 4. For two good reasons.

First, Epoch 4 is the best tape you can use, right now, on any transport. Because its coefficient of head wear is less than four per cent of the industry average.

Its modulus of toughness is 80 times greater. And it's the only tape in the business with a twenty-year warranty.

Second, there's the future. Sooner or later, you're going to upgrade to faster transports. 2420's, or something even faster.

Chances are, conventional tape won't perform properly on the new high-speed drives.

So, if you're buying anything less than Epoch 4 right now, your investment may soon be obsolete.

Think it over. Then try Epoch 4. It'll turn your transport into a super salesman.

 **GRAHAM
MAGNETICS**

Graham, Texas 76046